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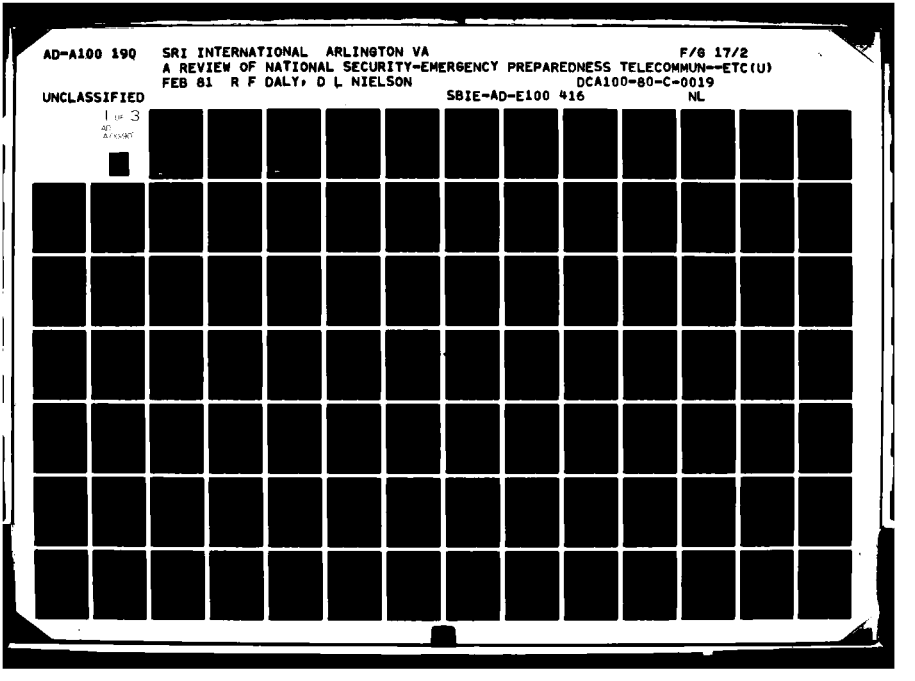

A REVIEW OF NATIONAL SECURITY-EMERGENCY PREPAREDNESS TELECOMMUNICATIONS POLICY

Final Report

February 1981

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Prepared for:

National Communication System
Washington, D.C. 20305

SRI Project 1653

Contract DCA100-80-C-0019

National Telecommunications Policy Review of U.S. Common Carrier Survivability, Restorability, and Interoperability During National Emergencies, Disasters and War

SRI International
1611 North Kent Street
Arlington, Virginia 22209

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Review domestic telecommunications policy and technologies that support communications. Analysis national security emergencies preparedness telecommunications objectives and derives technical and non-technical attributes of NS/EP telecommunication capability . Examines the implications of recent policy and regulatory developments regarding United States telecommunications.

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CAVEAT

National security and emergency preparedness telecommunications policy is a highly complex topic. It combines two currently volatile policy arenas that have been and continue to be the subject of much debate: national security and emergency preparedness policy and national telecommunications policy. In this study, we have identified, assessed and, where necessary, interpreted the changes and interactions of policies in these arenas; but our efforts can only be viewed as a first step in illuminating the intricacies of this subject. The responsibility for any inaccuracies in interpretation of fact or injustices to points of view regarding this material rests with SRI and not with the NCS.

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I EXECUTIVE SUMMARY

SRI International undertook this study on behalf of the National Communications System to examine the implications of recent policy and regulatory developments regarding U.S. telecommunications capabilities for purposes of national security and emergency preparedness (NS/EP). The purpose of the study has been to assess the impacts of these developments on the use of common carrier resources during national emergencies, including nuclear war, and to identify and describe a range of policy options that would enhance the effectiveness of these resources during such emergencies.

This report reviews domestic telecommunications policy, the organization of the Executive Branch for NS/EP telecommunications, and the technologies that support emergency communications. It analyzes NS/EP telecommunications objectives and derives from them the technical and nontechnical attributes of an NS/EP telecommunications capability. Deficiencies in our existing capability are noted. Finally, a set of policy options and courses of action are developed to address the deficiencies.

Coping with the consequences of a nuclear attack and dealing with the aftermath of a hurricane or an earthquake are crises of different magnitude, duration, and significance. But they have a critical feature in common: all such disasters would require reliable communications if the impacts were to be promptly assessed, informed decisions made, appropriate responses put into play, aid and relief effectively marshalled and dispatched to those in need, and social stability maintained. Because time is of the essence in emergencies and disasters, timely information is indispensable. The consequences of failures of communication could be devastating. When communications fail, people die needlessly.

Moreover, in the case of nuclear war, the survivability of telecommunications capabilities would be a factor determining the survivability of the contestants and their ability to respond to a first

strike. For this reason, telecommunications systems are themselves key targets in nuclear strategy. The corollary is that a survivable national telecommunications system buttresses the deterrence to nuclear war. Telecommunications capabilities are therefore critically important in the pursuit of peace through strength.

Nevertheless, one would not be able to discern the importance of telecommunications to national security and emergency preparedness from the haphazard and feeble attention often afforded to these critical factors in the diverse and Balkanized telecommunications forums of the Federal Government.

Coping with natural or man-made disasters such as Mt. St. Helens, Three Mile Island, or a surprise nuclear attack requires a rapid response that presupposes unity of purpose and close working relationships with and within the government. In fact, there are now a multiplicity of Federal agencies and congressional entities involved in or affecting national security and emergency telecommunications, with their roles, missions, and jurisdictions provided by separate laws, executive orders, rules, directives, and assignments. The net result of this fragmentation of the Federal government's telecommunications activities and responsibilities is frustration and uncertainty as to the direction and management of telecommunications initiatives in the event of disaster. One thing is certain: if effective legislative, regulatory, and executive actions are not brought to bear on telecommunications issues, the courts will decide them, whether or not the impacts on NS/EP capabilities are taken into account, which is not likely.

National Security and Emergency Preparedness Telecommunications Objectives

The role of the national telecommunications system in national security and emergency situations is illustrated by the requirements of the presidency in a nuclear war. In the event of a nuclear attack on the United States, the national telecommunications system would be absolutely essential to continuity of government, managing the war, conducting diplomacy, providing leadership for the country, and, if necessary,

determining the ranking surviving presidential successor. Thus, the system would be needed to support all four roles of a war-time President: commander-in-chief, head of state, chief executive, and political leader.

In November 1979, President Carter issued PD-53, a presidential directive establishing a national security telecommunications policy to provide essential capabilities to communicate during and after any national emergency. It established the following national security and emergency preparedness objectives:

- Connectivity between the National Command Authority and strategic and other appropriate forces to support flexible execution of retaliatory strikes during and after an enemy attack.
- Responsive support for operational control of the armed forces, even during a protracted nuclear conflict.
- Support of military mobilization in all circumstances.
- Support for the vital functions of worldwide intelligence collection and diplomatic relations.
- Continuity of government during and after a nuclear war or national disaster.
- Recovery of the Nation during and after a nuclear war or disaster.

Three additional presidential directives of interest have been issued within the past year. One directive, PD-58, set forth policies and measures regarding continuity of government and the succession of presidential leadership. Another, PD-57, established new policies for industrial and manpower mobilization. Both addressed the critical role of telecommunications before, during, and after a nuclear war. The potential for a prolonged, and possibly limited, nuclear war was the basis for PD-59, the third presidential directive, which President Carter issued in July 1980. This directive revised U.S. nuclear targeting strategy.

A general NS/EP telecommunications objective emerges from these presidential directives, which is to provide the President and other officials with an assured telecommunications capability that will permit them to execute their minimum essential functions with high confidence before, during, and following national emergencies or conflicts, including a prolonged nuclear war.

Attributes of the Required Telecommunications Capability

The essential features of a telecommunications system capable of effectively meeting national security and emergency preparedness requirements can be broken down into two categories: technical attributes and ones that are nontechnical. The technical attributes are the performance criteria for the system. The nontechnical attributes characterize the policy frameworks, institutional relationships, and decision mechanisms that govern the system and sustain it.

The technical attributes of a system that would satisfy NS/EP requirements are that it be:

- Available in time of need on a priority basis;
- Readily accessible at many points;
- Responsive to distributed control;
- Extensively interconnectible and manipulable to provide many alternative routes;
- Flexible in terms of sharing and preemption; and
- Capable of handling a variety of communications.

The nontechnical attributes of the system -- in effect, the political, economic and institutional bases for the physical network — are that it possess:

- A sound legislative basis that unequivocally recognizes the primary importance of a survivable national telecommunications system, other

considerations notwithstanding, and provides for correspondingly effective decision- and rule-making authority;

- A single, consistent, centralized source of policy and guidance;
- Authoritative executive direction backed by budgetary power;
- A supportive regulatory environment;
- A reasonable cost structure; and
- A realistic and appropriate financing arrangement.

In summary, a national survivable telecommunications system would consist of a nationwide backbone network with multiple linkages among government, carrier and private networks that would be used to reconfigure communications routes, should there ever be widespread damage to the system. Such a system should be able to survive even in a nuclear war. The perception of survivability is important, as noted earlier: the network should be so highly interconnected that the costs to an enemy to destroy all possible communications paths would be prohibitively high.

In short, the network would be survivable because it would be ubiquitous, redundant, and restorable. Vital elements of the network, such as important switching centers and junction offices, would be located outside likely target areas, wherever possible. Additionally, the network would provide emergency access and precedence routing for users with high priority needs during emergencies of all kinds. Such a network could be constructed using the public telephone system as the base.

Evolving Industry Structure

New technologies have been changing the telecommunications industry. Transmission technologies, such as communications satellites and light guides are lowering the costs of transmitting large quantities of data over long distances; digital technologies are enhancing the productivity and performance of switching systems; and microprocessors are revolutionizing terminal equipment.

New entrants in the markets for intercity telecommunications services and customer-premises equipment are converting former monopoly arenas into cauldrons of competitive activity. Decisions of the Federal Communications Commission and the courts have supported these changes in the telecommunications industry.

Other firms, including large enterprises that have not been in the telecommunications industry, have plans to offer intercity services that will add to the competitive tempo. Although the established common carriers will remain dominant for the forseeable future, the industry structure will become more complex as these new entrants take hold. The demand for increasingly varied information transfer services will continue to grow. An aggregation of networks is evolving where once there was a single integrated system operated by the established carriers.

Major Issues

The major issues in this study stem from a tension caused by conflicts of policy. There is, on the one hand, a series of policies that is establishing competition and deregulation in the telecommunications industry; on the other, there are national security policies that require the telecommunications industry to support vital NS/EP objectives. Thus, while the industry is undergoing basic changes regarding the provision of telecommunications services, new requirements are being placed on it to support needs that are fundamental to national survival, such as continuity of government.

One set of policies tends to encourage fragmentation in the industry; the other is best suited to coordination among firms in the industry. Three issues emerge from this conflict. Each reflects a problem focused primarily on one of the institutions — the telecommunications industry, the FCC, and the Executive Branch -- which, if not resolved, will hinder the development of the desired NS/EP telecommunications capability. The issues are:

Issue	Institutional Focus
• Inadequate Network Management for NS/EP Telecommunications	• Telecommunications Industry
• Regulatory Uncertainty for NS/EP Telecommunications	• Federal Communications Commission
• Fragmented Executive Branch Organization for NS/EP Telecommunications	• Executive Branch

Network Management. Network management refers to the processes of planning, implementing, operating and maintaining telecommunications networks. Since network management is crucial to the proper functioning of any network, the established common carriers have become highly skilled network managers. The management of a network owned exclusively by a single carrier is a relatively straightforward process. However, the management of a network of interconnected facilities belonging to different carriers presents not only technical and administrative challenges but a complex policy question as well. This is the question of joint planning.

Apart from market conditions, there are no incentives for joint planning among different carriers. It is very unlikely that market conditions alone will encourage joint planning among noncompetitive carriers of the kind required to achieve NS/EP telecommunications objectives; and antitrust prohibitions may discourage any joint planning at all among competing carriers.

Regulatory Uncertainty for NS/EP Telecommunications. Changes in the telecommunications industry structure prompted by technological innovation have been accompanied by an uncertain regulatory environment. The FCC (with encouragement by the courts) has favored regulatory goals such as eliminating cross subsidies, pricing services on the basis of their costs, introducing new technologies, and encouraging innovative services. However, their decisions have not always been predictable and they have sometimes been reversed by the courts on very significant questions.

In their preoccupation with achieving their goals, the FCC appears to have paid little attention to the question of what the changing industry stucture has meant for the Nation's NS/EP telecommunications capabilities.

Until a few years ago, this inattention seemed also to prevail in the Department of Defense. Meanwhile, the industry began to discontinue various practices they had established to enhance the survivability of their networks. It is not clear what measures the industry will take on its own in the future to improve the survivability and restorability of their networks. Nor is it certain whether the regulators will require them to take such measures. Moreover, even if it had passed, the legislation introduced in both Houses during the 96th Congress to amend the Communications Act of 1934 would probably not have resolved the regulatory uncertainty for NS/EP telecommunications. Without establishing parity of NS/EP telecommunications goals with other regulatory goals, this uncertainty can be expected to continue.

Fragmented Executive Branch Organization for NS/EP Telecommunications. The frequency with which the organizational arrangements and responsibilities of the telecommunications agencies in the Executive Branch have changed over the past 25 years has contributed its own measure of instability. At present, various responsibilities for NS/EP telecommunications are divided among several agencies. The question of the degree of unification of government telecommunications (a question that led to the creation of the National Communications System) needs to be reexamined in the light of new NS/EP telecommunications requirements and the changing industry structure.

The fragmentation of NS/EP telecommunications policy development functions in the Executive Branch presents a serious obstacle to achieving NS/EP telecommunications goals. Policy development responsibilities for NS/EP telecommunications have been assigned both in and out of the Executive Office of the President. The assignments are confusing and their coordination difficult. There is a need for a stronger representation of NS/EP telecommunications policy considerations in the deliberations over national telecommunications policy in the Executive Office of the President. Finally, better organizational mechanisms are needed to coordinate military and civilian emergency preparedness telecommunications.

Alternative Frameworks for the Required Telecommunications Capability

Various legislative, regulatory, and executive initiatives can be taken to bring order and greater certainty to the planning, organization, and provision of essential telecommunications services in the event of national emergency. These initiatives can be organized within the context of four policy frameworks. Within each of these frameworks, a combination of initiatives can be designed to bring about a telecommunications capability having the desired NS/EP attributes noted earlier. The policy frameworks can be characterized as follows:

- The Current Regulatory Framework.
- The Modified Regulatory Framework.
- The Presidential Authority Framework.
- The Monopoly Structure Framework.

The Current Regulatory Framework would require no change in legislation, but would involve some or all of the following initiatives:

(1) Designate an FCC commissioner, with the appropriate expertise and authority, whose primary function would be to assure that the existing NS/EP responsibilities of the FCC are effectively anticipated and met.

(2) Issue an FCC notice of inquiry into the impacts of competition on NS/EP capabilities.

(3) Establish an Advisory Council on Standards and Network Planning, under the auspices of the FCC, consisting of government and industry representatives whose focus would be on questions of interconnection, interoperability, system planning, target avoidance, restoration, and network management.

(4) Promulgate and enforce FCC standards to enhance the NS/EP qualities (e.g., survivability, restorability) of all carrier networks.

(5) Issue an annual FCC report to the Congress assessing the impacts of its decisions on NS/EP capabilities, including conflicts of policy involving the promotion of competition; and testify before the relevant congressional committees.

(6) Consider the use of extra depreciation incentives to encourage investment in NS/EP enhancement.

(7) Permit the inclusion of costs of NS/EP enhancement in the rate base.

(8) Set up a fund to be derived from surcharges on access to the core system and to be applied to common costs of NS/EP enhancement.

(9) Establish an NS/EP branch in FCC's Common Carrier Bureau to serve as the secretariat for the above initiatives.

The Modified Regulatory Framework would require that the Communications Act of 1934 be amended to provide guidance to the FCC, namely, to establish parity for NS/EP telecommunications goals and to ensure that they are not compromised in favor of other regulatory objectives. Such an amendment could be part of the larger effort begun in the last Congress to revamp the Communications Act and establish a legislative basis for the dramatic changes in the structure of the communications industry that have occurred over past two decades. Some of the steps suggested under the current regulatory framework (e.g., the FCC annual report to the Congress, designation of an NS/EP commissioner), all of them nonstatutory, could be embodied in the legislative amendment proposed here. In addition, the amendment could provide for subsidies and tax incentives to encourage or cover the costs of improvements in the survivability, restorability and interoperability of common carrier networks. Under this modified regulatory framework, the Rural Electrification Act could also be amended to permit certain interconnections of small, independently owned rural telephone offices.

The Presidential Authority Framework would require amendment of either the Communications Act of 1934 or the Defense Production Act of 1950 giving the President of the United States direct peace-time authority over the telecommunications industry to require it to meet NS/EP needs. Under the amended Defense Production Act, this authority would be exercised through conditions on the granting of radio licenses. It could also be applied through constraints on the use of other valuable resources, such as Federal lands and space orbital slots. Thus, for example, the President could require any telecommunications entity using a communications satellite or

employing a microwave repeater on a federally-owned mountaintop to meet certain standards in the construction and operation of its telecommunications network.

Under an amendment of the Communications Act of 1934 (specifically, Title II, Section 214), broad regulatory authority could be granted to the President enabling him to require any carrier to meet NS/EP standards as a condition to granting permission to construct new communications facilities, add to existing communications facilities, or reduce or discontinue services. Clearly, such authority would create extensive regulatory power within the Executive Office of the President. An alternative would be to amend Section 606 of the Act, which concerns presidential war powers, and to expand them to the extent required to meet NS/EP needs. An example of such an amendment is given in Chapter IX.

The Monopoly Structure Framework would establish a statutory monopoly to provide basic telecommunication services through a single integrated national system. The model for such legislation is the Consumer Communications Reform Act, a bill that was introduced in 1976 and subsequently abandoned. The scope of the monopoly would depend upon the extent to which the telecommunications services covered are defined basic. In any case, of the four alternative frameworks, this is the only one that would establish a single integrated system. It would also be the most controversial and difficult to enact. Clearly, such an arrangement would be most conducive to network management and planning, and because of its monopoly status, covering the costs of NS/EP enhancement would not engender any competitive disadvantage. Such costs could be included in the rate base.

Irrespective of the choices made among the four frameworks described, the Executive Branch must be better organized for the development and implementation of policies affecting the telecommunications capabilities of the United States in emergencies. Bits and pieces of NS/EP responsibilities are scattered throughout government; and more often than not, NS/EP considerations are ignored or eclipsed in communications policy-making forums that are preoccupied with the ideologies of

competition and deregulation. There needs to be an authoritative champion, spokesman, ombudsman for NS/EP telecommunication interests in the Executive Branch. Whether this responsibility is lodged in the person of an agency chief, a cabinet-level department head, or an assistant to the President is not as important as that the function be performed and the responsibility met. And time is of the essence.

II INTRODUCTION

A. The Need for a Study

Through a long history of association, the U.S. government has come to rely on the existing common carriers for nearly all of its domestic communications needs. This relationship has, for the most part, been fruitful for both the government and the telecommunications industry. For a variety of reasons, the government has chosen not to own and operate its own communications resources within CONUS, but to take advantage of the extensive and convenient services offered by the common carriers. This reliance has continued even in wartime. When war was waged on other continents, the dependence on the common carriers for domestic communications by the military was of little consequence. But given the threat of a modern war on this continent, the picture radically changes and this dependence needs to be examined.

A large fraction of the government's communications needs are provided by the established carriers. Most government communications are not critical in a national security and emergency preparedness (NS/EP) sense, but many are. For example, the National Communications System (NCS), with a substantial number of critical circuits, is almost totally dependent on the established carriers.

More important to this study, however, is that virtually all major Federal emergency communications systems rely substantially on some form of common carrier. This dependence has increased steadily over the past two decades. In the absence of other developments, this might in itself be cause for concern simply from a vulnerability standpoint. But other factors make an examination of the government's reliance on the telecommunications industry even more imperative.

First is the emergence of a different U.S. strategy concerning nuclear war. For two decades, U.S. planning for a possible nuclear war has focused on the so-called "worst case"--a major nuclear exchange between the Soviet Union and the United States with all the strategic forces of both sides used in a one-two or one-two-three fashion. Over the past two years, however, new strategies have recognized that a nuclear war might be multiphased and prolonged. The present notion of a strategic reserve force is in itself a measured response to attack. This new strategy has been voiced in presidential directives of November 1979 (PD-53) and July 1980 (PD-59) and in various DoD studies.

Under both short and prolonged war strategies, communications are vital, albeit in slightly different ways. In the earlier strategy, rapid and reliable communications, in combination with early warning systems, were essential for launching a nuclear strike while under attack. If either the warning or communications were too slow, then communications at least had to be survivable enough for retaliation to occur. Deterrence required as much.

In the face of a prolonged nuclear war, all previous demands on communications still exist, but the exceedingly difficult requirement of endurance is added. That is, communications must not only survive some initial onslaught, but it must do so under prolonged and repeated strikes. To provide this capability requires either a communications system that is too costly to target, is easily and quickly restorable, or both.

To these increased capabilities are added the requirements of redundancy and mobile accessibility for NS/EP telecommunications systems. The vastly increased Soviet nuclear arsenal now requires that all critical governmental functions--Federal, state, and some local--be redundant and distributed widely if they are ultimately to survive a nuclear attack. This requirement places new and increased demands on communications. Indeed, such a doctrine cannot exist without rapidly available communications. Thus, our increased reliance on the common carriers must be examined in light of these concepts.

The demands on a communications system that can meet the above needs are so extraordinary that little remains to be said of the required capability to meet lesser emergencies such as natural disasters. Yet our communications systems have to be able to deal with a wide range of crises, ranging from localized man-made or natural disasters to all-out nuclear war. A reason for opting for this broad scope is that during reconstitution following a nationwide attack, one encounters the same needs to permit local and state governments to function as during smaller emergencies where local authorities can cope autonomously or with modest regional or national assistance. One important exception to the above is the case of large scale mobilization. Here the requirement for expanding costly local-distribution communications plant may tax both time schedules and financial resources.

Thus, this study will be looking at the ability of our nationwide communications networks to function under times of localized or national stress. National security and emergency preparedness (NS/EP) is the phrase used to describe this area of concern. While the phrase applies to all levels of government, this study will focus on the national level. Because the national telecommunications networks are dominated by the common carriers, particularly by the integrated public telephone system (PTS), a serious discussion of a nationwide communications service with NS/EP attributes must focus on that network.

A second major factor requiring a new look at national security communications is the unprecedented changes in the telecommunications industry. They have resulted in increased competition and measured deregulation of the industry. Some changes may be inimical to NS/EP communications; some may not be. But each change should be examined and observed deficiencies corrected if the United States is to project a credible communications capability to an adversary.

A major focus of the new telecommunications regulatory concepts lies in the draft legislation recently offered as amendments to the Communications Act of 1934. Most telecommunications analysts agree that new legislation will emerge, but just when is uncertain. So one of the

major tasks of this study has been to examine the general trend of various actions by the industry, the courts, and the FCC, as well as the proposed new legislation.

B. The Protagonists

At question here is the ability of the national telecommunications networks to support NS/EP goals. Thus, the interested and affected groups are those charged with NS/EP responsibilities. For example, in addition to the National Communications System, at the Federal level this includes the President and organizations in the Executive Office of the President (EOP), the Congress, the Federal Communications Commision (FCC), the Federal Emergency Management Agency (FEMA), the National Telecommunications and Information Agency (NTIA), the intelligence agencies, the Department of Defense (DoD), and other cabinet-level departments. At the non-Federal levels are the state and local emergency preparedness offices and similar groups trained to act in times of emergency. Also involved are those supplying communications services and products, the communications industry.

C. National Implications

Recognizing the critical role the PTS must play in times of crisis and taking action to augment its performance under those conditions, may have broad implications for the industry and the public. For example, to correct existing technical and procedural deficiencies from the NS/EP standpoint, it may be necessary to require the public (either as ratepayers, taxpayers, or both) to pay for these improvements if they share in the benefits. The government, including its military components, may need to be able to preempt public use of the telephone for their own purposes in emergencies. If, during peacetime, substantial modification of the PTS becomes necessary for survivability and a preemption capability, how would the public respond?

Within the Executive Branch there may naturally arise the notion of a centralized authority for telecommunications. That authority must establish relationships with those who will supply the communications services, the industry. Where will the money come from? Who will head the

telecommunications function and how will it be organized? What is the proper relationship between NCS and FEMA? These are a few of the many questions facing the Federal Government as it considers the problem of a more credible NS/EP communications resource.

D. Major Issues

A host of issues have been created by the changing telecommunication industry structure and the increased dependence placed on that structure by NS/EP interests. The most general context in which to view these issues is the inherent conflict that arises when technological development cycles become much shorter than the time constants for the change in the institutions that use or deal with the technology.

The NS/EP concerns are founded in another conflict already mentioned. There has been a steadily increasing dependence by the NS/EP community on the existing common carriers, accompanied by a simultaneous decrease in interest and awareness in NS/EP matters on the part of the common carriers and their regulators. Separately, these two developments would be bad enough; together they present a very formidable point of departure for improving NS/EP telecommunications.

E. The Objectives of the Study

This study concerns the ability of the common carriers to supply telecommunications services in times of national stress. In the process, the study examined how dependent the government already is on the common carriers. This dependence has probably reached the point of irreversability.

The study's specific objectives are summarized in Table II-1.

Table II-1

Study Objectives

1. Assess the impact of current and developing telecommunications policy and regulatory initiatives on:

   - survivability,
   - restorability, and
   - interoperability

   of the U.S. common carriers during national emergencies, disasters, and war; and

2. Develop a range of policy options to enhance the survivability, restorability, and interoperability of *those resources during national emergencies*, disasters, and war.

This study seeks to assist in the creation of an NS/EP telecommunications capability that will better:

- serve government needs in times of emergency from the local to the national level;
- provide a credible element in our total deterrence posture; and
- serve the general public with a reliable communications network.

The last point is very important to stress. The public is the ultimate benefactor in not only obtaining greater communications support in time of stress, but in so far as adding a NS/EP capability improves the integrity of the public network, a greater reliability in day-to-day operation results as well.

F. Organization of Report

This report consists of five main parts. Background and preparatory material is presented in chapters II through VII. In these chapters the present situation and issues are discussed and explained. Chapter VIII presents a methodology for generating policy options and enough of a system concept to illuminate some NS/EP requirements. Chapter IX contains a range

of policy options and constitutes the major results of the study. The last chapter contains specific suggestions for NCS. SRI does not intend to recommend any of the particular policy approaches defined in chapter IX, giving instead the pros and cons of each. Finally, the major issues and policy options are summarized in the Executive Summary.

Three supplementary working papers have been submitted in conjunction with this study. They are internal working papers not required by the contract; yet they resulted from tasks on background, on policy and technology trends, and on relevant issues. A library on the general subject of NS/EP telecommunications policy, collected during the course of the study, has also been delivered to the NCS.

III NATIONAL SECURITY AND EMERGENCY PREPAREDNESS TELECOMMUNICATIONS

A. National Security and Emergency Preparedness Telecommunications Objectives

1. Historical Perspective

The nation's telecommunications resources are essential to our ability to respond to crises; and, to the extent that they are survivable, they serve as a component of our deterrent posture for defense. These resources provide the critical communications required to deal with a range of emergencies--from local disasters to large-scale nuclear war (see Fig. III-1). For the most part, the resources are owned and operated by established common carriers and leased to various Federal agencies to support their diverse missions. Until after World War II, however, there was no organizational structure to formulate NS/EP telecommunications policy and related objectives at a level higher than the mission agencies. The first major step was the establishment of the position of the Director of Telecommunications Management (DTM) on Feb. 19, 1962 in the Office of Emergency Planning by Executive Order 10995, and the assignment to the Director of several functions, including:[1]

> Coordinate telecommunications activities of the Executive Branch of the Government and be responsible for the formulation, after consultation with appropriate agencies, of overall policies and standards therefore. He shall promote and encourage the adoption of uniform policies and standards by agencies authorized to operate telecommunications systems. Agencies shall consult with the Director of Telecommunications Management in the development of policies and standards for the conduct of their telecommunications activities within the overall policies of the Executive Branch.

The next major step occurred on August 21, 1963 when, as part of the response to the Cuban missile crisis, the National Communications System (NCS) was established by Presidential Memorandum (PM) during the

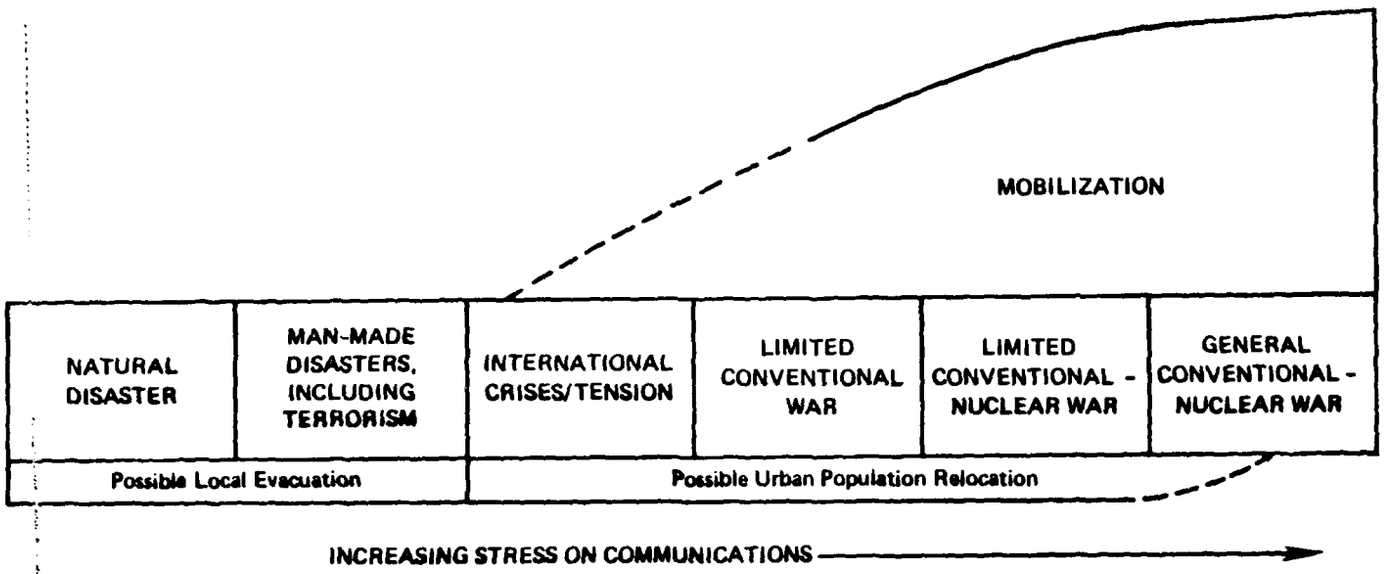

Figure III-1 SPECTRUM OF NATIONAL EMERGENCIES

Kennedy Administration[2]. In creating the NCS, President Kennedy articulated an NS/EP objective that surpassed the objectives of the existing mission agencies:

> "The objective of the NCS will be to provide necessary communications for the Federal Government under all conditions ranging from a normal situation to national emergencies and international crises, including nuclear attack. The system will be developed and operated to be responsive to the variety of needs of the national command and user agencies and be capable of meeting priority requirements under emergency or war conditions through use of reserve capacity and additional private facilities. The NCS will also provide the necessary combination of hardness, mobility, and circuit redundancy to obtain survivability of essential communications in all circumstances."

This PM establishing the NCS delegated to the DTM the policy direction for its development and operation. The DTM was also designated to serve as a Special Assistant to the President for Telecommunications. In 1969, President Nixon assigned emergency preparedness functions to the Federal departments and agencies in Executive Order 11490 (amended in 1976 by E.O. 11921).[3]

The next significant statement of NS/EP telecommunications objectives occurred some 16 years later when President Carter issued Presidential Directive 53 (PD/NSC-53) in November of 1979.[4] PD-53 addressed the need for a national security telecommunications policy that would provide for the essential capabilities to communicate during and after any national emergency. Specifically, PD-53 established the following NS/EP telecommunications objectives:

- Provide connectivity between the National Command Authority (NCA) and strategic and other military forces to support flexible retaliatory strikes during and after an enemy nuclear attack.
- Support operational control of the armed forces, even during a protracted nuclear conflict.
- Assist military mobilization in all circumstances.
- Support the vital functions of worldwide intelligence collection and diplomatic affairs.
- Provide for continuity of government during and after a nuclear war or national disaster.

- Promote national recovery during and after a nuclear war or natural disaster.

In addition to confirming and elaborating on the objectives established in 1963, PD-53 adds a significant new dimension to NS/EP telecommunications objectives. It stated the need for NS/EP telecommunications to endure a nuclear war "to gather intelligence, conduct diplomacy, command and control military forces, provide continuity of essential functions of government, and to reconstitute the political, economic, and social structure of the Nation." Thus, NS/EP telecommunications must be capable of surviving a nuclear attack to support critical activities regarding the conduct of, termination of, and recovery from a possible prolonged nuclear war.*

The role of the President (see Fig. III-2) and Continuity of Government (COG) during a nuclear war have been basic factors in motivating the development of NS/EP telecommunications policy and objectives. Both the creation of the NCS and the formulation of the national security telecommunications policy espoused by PD-53 stem largely from these concerns. As indicated in Figure III-2, a wartime President has four major roles:

- As commander-in-chief (CIC), the President, or the Secretary of Defense as his delegated alternative National Command Authority (NCA), must:
  - Control the strategic nuclear forces;
  - Control general purpose and theater nuclear forces;
  - Direct continued intelligence activities, including assessment of damage in the USSR and elsewhere; and
  - Assess damage in the United States, and, if required, direct military forces to maintain internal order and the protection of borders.

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* For example, see L. Sloss, et al., "Prolonged War and Nuclear Targeting," Final Report, SRI Project 1443, SRI International, Arlington, Va, November 1980.

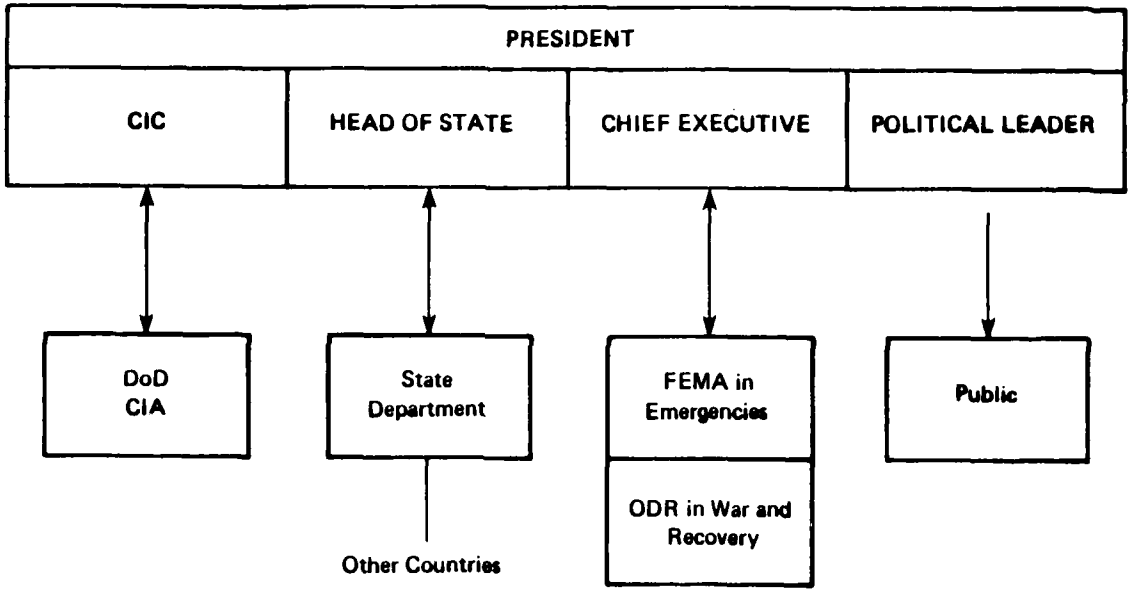

Figure III-2 KEY PRESIDENTIAL FUNCTIONS IN EMERGENCY AND WAR

- As head of state, the President must:
  - Maintain direct or indirect communications with hostile countries to terminate the war on acceptable terms;
  - Communicate with U.S. allies to coordinate prosecution of the war, maintain the alliance, and consult in terminating the war;
  - Communicate with third countries, including neutrals, enemies and allies (recognizing that in wartime an erstwhile U.S. ally might become either of these).
- As chief executive and political leader, the President must communicate directly or through subordinates, as rapidly and continuously as feasible, with state and local officials and with the surviving population on:
  - The state of the national government, including the identity and legitimacy of a successor (if required);
  - The state of the war;
  - The will of the government and the expression of its leadership to help sustain the morale of the populace;
  - Information on measures being taken to assist the people to survive and recuperate;
  - Priorities for communications, and allocations of materials and facilities to prosecute the war--remembering that the war may be protracted, and that the durability of any truces may be uncertain for considerable periods; and
  - The declaration of martial law (if required) and other actions taken to manage the emergency.

Each of these roles give rise to communications requirements for the President and other officials at all levels of government (see Figure III-3). The following NS/EP telecommunications objectives are related to the fulfillments of those requirements.

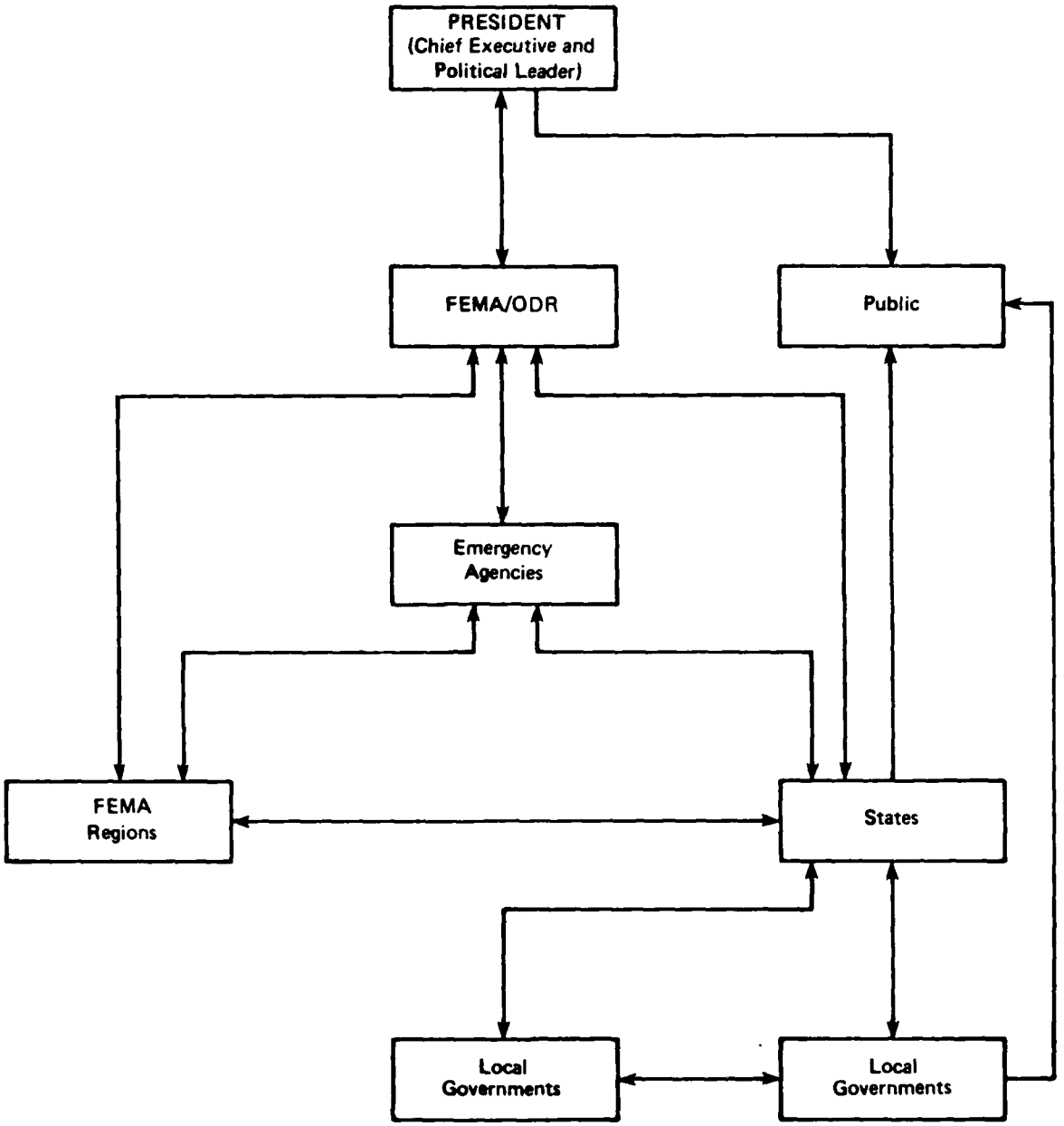

Figure III-3 DOMESTIC EMERGENCY COMMUNICATIONS NEEDLINES

2. Summary of General NS/EP Telecommunications Objectives

Since the Federal, state, and local governments all require effective telecommunications to function in an emergency, NS/EP telecommunications planners and managers seek to assure the President and other government officials of a telecommunications capability that will permit them to effectively execute their minimum essential functions with high confidence and perform other functions before, during, and following national emergencies or conflicts--including protracted nuclear war.

B. Current Policies Related to NS/EP Telecommunications

1. Strategic Background

The strategic background has been summarized by Foster, et al:[5]

> "Over the past two decades, significant changes have occurred in the longstanding competition between the United States and the USSR. Many of these changes have been adverse to U.S. interests. Critical strategic asymmetries between the two superpowers have emerged, including differing strategic concepts of nuclear deterrence and warfare. For some years the U.S. strategy of deterrence rested on the premise that parity would lead to stable nuclear deterrence, which would be achieved primarily through fear of mutual assured destruction. By contrast, the Soviets appear to have developed a strategy of seeking strategic superiority through balanced offensive and defense forces, with survival and victory as the objective if nuclear war should occur. A shift in the global balance of power has taken place, resulting from a determined Soviet expansion of its military power (conventional and nuclear) through a growing level of defense expenditures, at considerable sacrifice to the civilian economy. The Soviets have exploited these asymmetries to attempt to undermine U.S. assurances to its allies and to call into question the guarantee of America's nuclear umbrella. They have seized numerous opportunities to take initiatives and exploit political, economic, and security instabilities in the Middle East, Asia, Africa, and Latin America, with little opposition from the West.

Over the long term the American-Soviet competition and conflict are further compounded by increasing instabilities in the developing world; limited and maldistributed sources of energy, raw materials, food and investment capital; proliferation of conventional and nuclear weapons; and often destructive economic competition and changing political goals amongst the developed nations, for example, in the Middle East."

2. Current Policies Pertinent to NS/EP Telecommunications

The United States has adopted new national security policies as a result of the strategic situation described above. These new policies significantly affect NS/EP telecommunications. They were set forth in presidential directives (PDs) and include the following points summarized by Foster, et al:[5]

- Flexible Response and Nuclear Targeting (PD-59)
  Trends through the 1970s toward adding Flexible Response to the Mutually Assured Destruction (MAD) doctrine culminated in July 1980. According to reports, new priorities are set for targeting enemy strategic forces, political control (leadership and its C^3 facilities), other military targets, and war supporting industries. An enduring Secure Reserve Force (SRF) is to be withheld to provide a deterrent to enemy escalation to urban attacks. This doctrine, which implies the need to prepare for the possibility of a prolonged war, imposes unprecedented demands on preparations for the survival, endurance, and restorability of the national command-control-communications (C^3) system, including the telecommunications core network.

- Continuity of Government (PD-58)
  Policies and measures to assure continuing presidential leadership and the continuity of government in case of nuclear war were issued in June 1980. They place great stress on the requirement for survivable and enduring NS/EP telecommunications.

- Mobilization (PD-57)

  New policies for industrial and manpower mobilization were issued in March 1980 to emphasize this neglected area of Federal emergency management.

- National Security Telecommunications Policy (PD-53)
  In November 1979, a new national security telecommunications policy was established. Key

features are: national security and COG should have major focus; common carrier networks should be interconnected and government networks should be interoperable; the Federal Emergency Management Agency (FEMA), in coordination with the NCS, should plan for emergency use of private networks; there must be a capability to manage network restoration and reconstitution; and NCS should consult with the Federal Communications Commission (FCC) on implementing the above and should place substantial reliance on the private sector common carriers.

Significantly, the first of these directives to be issued (PD-53) provides policy guidance for the NS/EP telecommunications needed to ensure implementation of the others, (PD-57, -58, and -59).

C. The NS/EP Telecommunications Organization in the Executive Branch

1. General Comments

Because of its origins, the current organization for NS/EP telecommunications in the Federal Government is complex. Some of the agencies involved have long, established traditions and political constituencies, while others are relatively new. The result, especially since World War II, has been changed and uncertainty in organizational arrangements which continues today. This summary is based on government documentation and several recent summaries.[6-9]

2. Historical Background of NS/EP Telecommunications Authority

The U.S. Army Signal Corps was responsible for providing government communications (including NS/EP communications) from the Civil War through World War II.[10]

The history of Executive Branch involvement in telecommunications following Marconi's 1901 transatlantic wireless sound tramsmission demonstration has been summarized by Rourke and Brown:[9]

> "...With the rapid development of this technology, the need soon arose for government help in equitably distributing a limited number of usable radio

frequencies among a multitude of potential users. The President's first share of responsibilities in the management of radio communications came just over a decade after Marconi's historic breakthrough."

"Under the Radio Act of 1912, authority was granted to the Secretary of Commerce and Labor for licensing and assigning frequencies to any person, company, or corporation, wishing to transmit interstate or international radio signals. In addition to this grant of executive licensing jurisdiction, the President was given power to assume control of all wireless communications facilities in the event of war, public peril, or disaster. The President's far-reaching perogatives with respect to emergency or wartime communications remain an important aspect of executive authority. But the right of the Secretary of Commerce to regulate the radio industry gave way 15 years later to a completely revised division of responsibilities between the Executive and Legislative Branches."

"...In a series of annual radio conferences, broadcasters pleaded for controls to be placed on the number of new licensees to alleviate the interference caused by overcrowded airwaves. Disagreement arose, however, when Congress considered the question: Who should exercise such critical regulatory power, a succession of cabinet secretaries like Hoover or a permanent, independent commission which would be better insulated from day-to-day changes in the political environment? Secretary Hoover, with the support of President Coolidge, argued that the 1912 law had set the precedent for Executive Branch Control of radio communications and told an interviewer, 'The tendency to create in government independent agencies whose administrative functions are outside the control of the President is, I believe, thoroughly bad'."

Out of this debate came a broad compromise in the form of a complicated dual system of governmental control over the increasingly important area of radio communications. Under this system, the allocation and management of all radio frequencies and other communications resources used by agencies of the Federal Government were the President's responsibility. Congress reserved the authority to regulate the private communications industry, as well as the broadcasting functions of state and local governments. After a long-running debate over the feasibility of self-regulation by the commercial radio industry, these regulatory duties were delegated by Congress in 1927 to a temporary independent body known as

the Federal Radio Commission (FRC).[13] Then in 1934, the FRC was superseded by the permanent Federal Communications Commission (FCC) in an effort to streamline the regulatory process and grant the Commission more latitude for planning and policy formulation.[14]

The Communications Act of 1934 (as amended--see also Section IV) established the Federal Communications Commission (FCC) as an independent body charged with the regulation of the communications common carriers, and with authority over all interstate and foreign communications by wire and radio.

Under Section 606 of the Communications Act, the President can assume the FCC's authorities over the common carriers in time of war or declared national emergency. Upon presidential proclamation that there is a threat of war, public peril, or other national emergency, the President can suspend or amend the FCC rules and regulations and authorize the government's use or control, with just compensation to the owner, of any facility, device, apparatus, or equipment for wire communication. In addition, during any war in which the United States is actually engaged, the President can give preference or priority to any communications deemed essential to the national security or defense. Finally, the President can use the U.S. armed forces to prevent any obstruction or retardation of interstate or foreign communication during a war in which the United States is actually engaged.

While the emergency authority conferred upon the President by the Communications Act is broad, each of the specific powers for control is explicitly limited to national emergency and war conditions. The powers to establish communications procedures and priorities and to use the armed forces to prevent obstruction of communications services are confined to conditions of actual war, and the power to suspend or amend FCC rules is confined to conditions in which there exists a war or threat of war or other national emergency. Title I of the 1934 Act gives the FCC authority to regulate the peacetime communications industry as required for the national defense and the promotion of safety of life and property. This could be interpreted to mean that the FCC has statutory authority over

the common carriers for national security or emergency telecommunication planning, preparation and implementation during peacetime conditions (see also the discussion in Section IV). However, the Communications Act does not explicitly authorize the FCC to permit the common carriers to plan, make preparations, and implement arrangements in peacetime that may or will be required during emergency conditions including those related to national security.

The Executive Branch organizational arrangements were relatively static until World War II. The Army Chief Signal Officer had been tasked to advise and assist the FCC on technical matters. During World War II, a Board of War Communications (BWC) consisting of the Chief Signal Officer of the Army, the Director of Naval Communications, representatives of the departments of State and Treasury, and the Chairman of the FCC functioned as a planning and coordinating committee for the control of radio and wire communications. Now consider the history of the NS/EP telecommunications authority and responsibility in the Executive Branch from the end of World War II to the present time.

At the end of WWII, there was a need for a peacetime replacement for the BWC. Several options were considered. Rourke and Brown describe part of this history.[9]

> "...So, the creation of IRAC*, while removing the routine chore of allocating government frequencies from the President's desk, did not fill the need for a more impartial, broader-based body for coordination and policy-making in the telecommunications field."
>
> "Another attempt was made to fill this void in 1946 with the establishment of the Telecommunications Coordinating Committee (TCC), made up of represen-

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* Authors' Note: In 1922, Commerce Secretary Hoover had established the Interdepartment Radio Advisory Committee (IRAC), in the Executive Branch to assist President Harding with the routine tasks of radio frequency allocations, allotments and assignments. Today, the IRAC, which includes an FCC liason member, is the oldest standing committee in the Federal Government. It is presently administered by the National Telecommunications and Information Administration (NTIA) in the Department of Commerce.

tatives from the Departments of Defense, State, Treasury, Commerce, and the FCC. The TCC was to serve as a forum for the consideration of broad telecommunications policy questions and for the promotion of 'the most effective use of wire and radio facilities.'[16] However, as might be expected, given the time of its creation, the committee was preoccupied with the state of defense communications in the post-World War II period and was largely controlled by its military representatives."

"Besides its overly narrow focus, the TCC had other problems which prevented it from becoming an effective telecommunications advisory group. First, the FCC complained that its own mandate for policy formulation was being unduly intruded upon by the new committee. Even though the FCC had a membership on the coordinating body, its representatives argued that their responsibilities for policy advice to the Congress overrode their participation in any other forum and thus limited their cooperation with the TCC. Second, the Secretary of State, who had taken the initiative in setting up the TCC, insisted that the group act only with unanimous agreement and not trespass on any other agency's statutory responsibilities. In the face of these obstacles, the TCC became another failed attempt to establish an effective coordinating body for national telecommunications policy, and it survived only in the limited role of an advisory committee to the State Department."

The BWC was abolished early in 1947, and the National Security Act of 1947 eliminated the direct role of the Signal Corps.[18] A period of change and uncertainty regarding organizational arrangements within the Executive Branch has existed ever since. The General Services Administration (GSA) was given the authority for both routine and emergency procurement of telecommunications services and equipment (excluding selected NS/EP services) for the Federal Government under the Federal Property and Administrative Services Act of 1949.[19] GSA currently is charged with the provision and operation of a common user service called the Federal Telephone Service (FTS).

Growing demand on the radio frequency spectrum after World War II led President Truman to establish the President's Communications Policy Board in 1950. After a year of study, the Board recommended:[16]

> "...immediate establishment in the Executive Office of the President of a three-man telecommunications advisory board served by a small, highly qualified staff to advise and assist the President in the discharge of his responsibilities in the telecommunications field. Its task would include formulating and recommending broad national policies in this field, and giving advice and assistance in the formulation of policies and positions for international telecommunications negotiations."

As a result of the Board's report, the position of Telecommunications Advisor to the President was established in the Executive Office of the President and the Interdepartment Radio Advisory Committee (IRAC)[15] was assigned to assist him. Late in 1951, President Truman delegated his Sec. 606c powers of control over radio stations operating within U.S. jurisdictions to the FCC.[20]

President Eisenhower abolished the office of the Telecommunications Advisor in 1953 and transferred his functions to the newly created Office of Defense Mobilization (ODM).[21] In 1957, he delegated his powers under Sec. 606 a,c,d, to the Director, ODM.[22] The ODM was subsequently merged into the Office of Civil and Defense Mobilization (OCDM) within the Executive Office of the President.[23] Joyce notes that...[6]

> "In 1958, a special advisory committee on telecommunications established by the Director of OCDM recommended the creation of a National Telecommunications Board within the Executive Office to advise the President on Federal communications matters. The board was not established."

> "An examination of regulatory agencies conducted for President-Elect Kennedy under the direction of James M. Landis found the Federal Communications Commission weak in policy-making and recommended establishment of an office for coordination and development of communications policy within the Executive Office and transfer to this office of all powers assigned to OCDM relating to telecommunictions. Instead, the President limited changes primarily to the management of government telecommunications. He

established the Office of Telecommunications Management (OTM) in the EOP and the position of Director of Telecommunications Management (DTM) as one of the Assistant Directors of the Office of Emergency Preparedness (OEP), a successor agency to the OCDM."

The DTM also was a special assistant to the President for Telecommunications.

Meanwhile, the national role of the Army Signal Corps declined after 1947 as the other services established their own communications capabilities. The 1950s was a period of intense interservice rivalry, and coordinated joint planning was difficult. The Chief Signal Officer initiated a multi-year study in 1959 by Stanford Research Institute (now SRI International) and the Bell Telephone Laboratories (BTL)* to provide guidance for the improvement of communications systems supporting the command and control of national capabilities and resources through 1975.[25] Conducted from a national perspective, the SRI/BTL study recommended that DoD create a telecommunications organization to coordinate the planning of the individual services. The Defense Communications Agency (DCA) was created in May 1960.[26]

In the summer of 1961, the President split civil defense responsibilities between the Secretary of Defense and the Director, OCDM.[27] In the fall of 1961, Congress amended the President's Reorgnization Plan No. 1 of 1958 and converted the OCDM into the Office of Emergency Planning.[28]

In February, 1962, the DTM was established in the OEP;[1] and, in September of 1962, emergency preparedness responsibilities (including telecommunications) were assigned to OEP.[29] The DTM acquired additional responsibilities early in 1963 through an amendment to E.O. 10995 which included responsibilities for radio frequency assignments and for foreign radio stations operating in the U.S.[30] He then delegated to the FCC, under the policy guidance and direction of the OEP, responsibility to prepare national emergency plans and programs for telecommunications.[31] In 1968

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* The history of the Bell System's support to NS/EP telecommunications (1925-1975) is summarzed in Ref. 24.

the Office of Emergency Planning (OEP) became the Office of Emergency Preparedness (OEP) with the same initials and essentially the same functions.[32]

Meanwhile, on the military side, the Joint Chiefs of Staff (JCS) subsequently reaffirmed the need for retaining the Defense Communications Agency to develop the Defense Communications System (DCS) to accomplish, in part, the NS/EP telecommunications objectives. However, the Cuban missile crisis of 1962 had clearly demonstrated to President Kennedy the shortcomings in the communications support that he needed to control the military, including the nuclear forces. Particular difficulties occurred with respect to his ability to communicate with the heads of foreign governments who needed to be informed on the crisis as the situation progressed. The government--along with AT&T, ITT, and other established carriers--had to create an inter-American communications network to facilitate the communications with these countries. Following a National Security Council (NSC) investigation, President Kennedy created the National Communications System (NCS) in August, 1963 with the goal of linking government systems into a unified, long-haul network.[2]

The Office of Telecommunications Management (OTM) and the NCS were clearly eastablished to support national security. The communications facilities available to the Federal Government were intended to be those needed to take care of all emergency conditions, including a nuclear attack. President Kennedy's 1963 memorandum required the establishment of the NCS by linking together, improving, and extending on an evolutionary basis the communication facilities and components of the various Federal agencies. Significantly, the DTM was made a presidential assistant for telecommunications to ensure direct access to the President. Thus, the Director would be able to reflect the President's policies regarding national security and emergency preparedness. In this role, the Director was to work closely with the President's national security advisor. The Director was also designated to carry on the work of the National Security Council's Subcommittee on Communications (which had been abolished when the OTM was created).

Since the Department of Defense had the principal responsibility for ensuring national security and emergency preparedness, the Secretary of Defense was made the Executive Agent for the NCS with authority to delegate those responsibilities within the Department. Accordingly, the Director of the Defense Communications Agency was made the Manager of the NCS. A small staff was created within the Defense Communications Agency to manage the NCS. Other departments and agencies having a communications responsibility were designated as major or minor agencies, depending on the extent of their communications development and involvement in national security and emergency preparedness. Each was to appoint a representative to work closely with the NCS staff.*

Neither the Office of Telecommunications Management (the telecommunications assistant to the President) nor the NCS had a statutory basis--they were created under existing presidential authority. According to a 1969 GAO study, the Office of Telecommunications Management and the NCS staff were relatively ineffective during the early period of 1963-1967 with regard to their basic mission: the linking together of the government's communication facilities and assets, and the design of a national communications system.[33] The primary difficulty was the unwillingness of the departments and agencies responsible for their individual communications services to merge these services with the NCS, an action which would require relinquishing control of their own assets to create a larger national capability.

The Executive Memorandum President Kennedy signed on August 21, 1963, remains in force today, but it has been modified twice with respect to the Office of Telecommunications Management. The NCS organization has continued essentially as it was created in 1963. During the ensuing nine years the organization had not been able to carry out the requirements of

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* The FCC initially was a member of the NCS as a minor agency because of the emergency preparedness responsibility assigned by the President, but the FCC withdrew after several months.

the Executive Memorandum. Therefore, in 1972, the Executive Agent, NCS, reexamined the purpose, concepts, and principles of the NCS.[34] After several months of study, with participation by all the NCS operating agencies, it was concluded that the NCS had served a useful purpose and could continue to do so.[35] However, it was believed by the Executive Agent that the NCS must be redirected to achieve broader goals, as the NCS has noted:[36]

> "It was agreed that the NCS is not a single integrated, all-purpose communication system and probably never could be without some statutory changes. Furthermore, it was agreed that the benefits of such a single system, if any, were not apparent. The definition of the NCS that remains in use today was then developed. The NCS is a confederation in which Federal agencies participate with their telecommunications assets for the purpose of achieving:
>
> - A high assurance of effective satisfaction of the most critial telecommunications needs in any possible emergency situation;
>
> - The most effective and economic satisfaction of day-to-day telecommunications needs of the Federal government."

Returning to the domestic side, in August of 1967, President Johnson appointed a task force on communications policy.[37] Headed by E. V. Rostow, it was composed of representatives from departments and agencies involved in telecommunications (including the FCC), and supported by a significant staff from both government and private institutions. The task force was charged with examining international communications policies and the policy alternatives for domestic satellites. But it went beyond this charge to investigate the entire subject of the domestic telecommunications industry.

The task force concluded that the Federal Government required "a long range planning, policy-formulating and coordinating, and mission support capability which can serve to integrate the various roles in which the Executive Branch is presently engaged."[38] Among other proposals, the task force recommended that competitive entry into the domestic telecommunications market be allowed for interstate private-line services,

but the need for continuation of an integrated common carrier communications network for public telecommunications services was recognized.[14] It emphasized the need for integrated control of the network and suggested that there was a case for a private regulated monopoly.

In particular, the task force emphasized the essential ability of an integrated network to provide universal access not only from and among all telephones and terminals connected, but also to interconnect the recommended competitive private line services. A minority position also noted that, for crisis management, a completely reliable communications capability was required within the Nation; and such a capability was also need for communications with our own forces and with our allies overseas.

The task force report recommended to the Bureau of the Budget (now the Office of Management and Budget, OMB) that certain organizational changes be made to strengthen the OTM's capability to address a broader range of policy questions. It recommended that the OTM be given adequate technical and financial resources to undertake long-range studies and to advise the FCC, state governments, and Executive Branch agencies, as well as private groups and industries, on specific issues and to explore new applications of telecommunications. Above all, the OTM should coordinate the development of coherent and forward-looking telecommunications capability. This recommendation, however, did not include a specific national security role and, as a consequence, did not deal with policies regarding national security telecommunications or place national security in perspective with other policy needs.

Yet another study, this one by the Bureau of Budget (now OMB), recommended in December 1968 that a new communications organization be established in either the Department of Commerce or the Department of Transporation.[39] The same GAO study mentioned earlier[33] endorsed the concept of a new organization as a means of strengthening the National Communications System:

> "We believe that a realignment of the existing NCS structure and organizational arrangements should be undertaken. As the first and essential step, an organization or entity at the highest level of the Executive Branch of the Government, free of any conflict of roles, should be put in charge of the Government's telecommunications activities. We believe that the organization or entity should be given sufficient resources and stature to enable it to provide the President and the Government with a strong central telecommunications authority and serve as the Government's focal point for telecommunications policy and planning."

The GAO also favored retaining this entity in the Executive Office of the President "to provide the stature to enable the necessary central authority to deal effectively with the departments concerned... we believe that an office working as a close adjunct to the White House could be of vital importance in times of national emergency."

The Nixon administration created a new telecommunications entity within the Executive Office of the President. According to Joyce, they were "...influenced at least in part by national security considerations."[6] The Office of Telecommunications Policy (OTP) was established as part of the Executive Office by Reorganization Plan Number 1 of 1970, which delegated the President's statutory authority for Federal government frequency management to the Director, OTP.[40] Later that year, Executive Order 11556 assigned additional functions to OTP and designated the Secretary of Commerce to provide research and analysis support to OTP.[41]

The OTP was organized with four major divisions: domestic telecommunications policy, international policy, frequency management for the Federal Government portion of the frequency spectrum, and government communications activities. The national security responsibility was included in the last division. The government communications division was given the responsibility for developing the general policy direction for the NCS. The head of OTP was made a director in the President's executive office, thus raising OTP's authority and prestige; whereas the director of OTP's predecessor office had been a presidential assistant.

Despite GAO's objective of establishing in the EOP an agency "free of conflict of roles," OTP quickly became involved in political problems. As Joyce notes:[6]

> "...during the Nixon Administration, the most widely discussed telecommunications policy issues centered on the future of television. The emergence of broadband cable technology promised a wide diversity of new services, but it also threatened the existing economic structure of the broadcasting industry. OTP's attention to the promising aspects of cable television, coupled with charges of Administration antipathy towards network news programs and the public affairs activities of public broadcasting, created an image for OTP of a politically motivated enemy of the nation's broadcast television industry."

Despite the fact that the 1967 presidential task force[38] did not recommend a NS/EP role for the OTP, its original functions were heavily weighted toward the development of policies and plans in support of national security and emergency preparedness.[42] However, successive OTP directors all became preoccupied with issues affecting the common carrier industry--as well as the broadcast, television and cable television industries. Although OTP was properly concerned with important changes in the communications industry, national security telecommunications functions had a relatively low priority. As a consequence, OTP had little impact on the development of national security requirements and on objectives to be imposed on (or achieved through positive coordination with) the then established common carriers. Meanwhile, the President transferred all civil emergency preparedness functions to the GSA (Federal Preparedness Agency).

Government communications planning--particularly the development of Federal Emergency Plan D (Annex C-XI)[43]--was encouraged by OTP, and OTP Circular 12 created a lead-agency plan in the hope of creating movement toward the NCS goal.[44] Nevertheless, there was little or no progress towards development of an NCS concept or a definitive long-range plan to perform the initial charge of the NCS (i.e., the linking of the government's telecommunications assets for NS/EP use). On the other hand OTP did resolve a number of national security telecommunications problems such as establishing policies for the electromagnetic pulse (EMP) testing

program, standards for digital transmission, etc. These other activities and interests of OTP—though extensive in time and effort--received almost no public attention or recognition. As Joyce noted in 1976:[6]

> "This naturally led to calls for the abolition of OTP as part of post-Watergate house cleaning. However, when it became known in January 1975 that a decision had been made to abolish OTP, an unexpected negative reaction from congressional and private sources led to a reversal of this action. But the lack of a permanent Director for OTP since September 1974, successive budget cuts, and continued rumors of OTP's demise created continuing uncertainty about the Administration's commitment to the current arrangements for telecommunications policy development and coordination within the Executive Branch."

With the advent of the Carter Administration, the White House staff was to be reduced as promised during the 1976 presidential campaign. The OTP was again a prime candidate for being abolished. The two major groups concerned with telecommunications policy in the Carter White House were the Domestic Council and the National Security Council. These groups did not agree on the priority of NS/EP telecommunications. The White House domestic policy staff had five major goals in telecommunications policy during the Carter administration, as discussed by Neustadt late in 1979:[45]

1. Reorganize the Executive Branch telecommunications agencies (to abolish OTP, in the Executive Office of the President, and the form the National Telecommunications and Information Administration in the Department of Commerce.)

2. Promote diversity and competition in the industry (through the 1934 Communications Act rewrite, to "protect" competition from the dominant carrier, AT&T, while maintaining universal service).

3. Regulatory reform (weed out needless regulations).

4. Information flow (support for the free flow of news and ideas in the U.S. as well as worldwide).

5. Defend personal rights to privacy (which are increasingly threatened by advances in telecommunications and computer technology).

Reorgnization Plan No. 1 of 1977 accomplished the first goal by abolishing OTP,[46] and transferring to the President its functions (and those of its Director) relating to "(1) the preparation of presidential telecommunications policy options including, but not limited to those related to the procurement and management of Federal telecommunications systems, national security, and emergency matters; and (2) disposition of appeals from assignments of radio frequencies to stations of the United States Government..." The plan also stated that the President "may delegate such functions within the Executive Office of the President as the President may from time to time deem desirable. All other functions of the Office of Telecommunications Policy and of its Director are hereby transferred to the Secretary of Commerce who shall provide for the performance of such functions." The plan also established the position of Assistant Secretary of Commerce for Communications and Information--to be appointed by the President by and with the advice and consent of the Senate. The Executive Orders repealed by the plan were: E.O. 11556 (September 4, 1970); and, in part: E.O. 10705 (april 17, 1957), E.O. 11051 (September 27, 1962) and E.O. 11490 (October 28, 1969). The EOP assured the Congress (September 28, 1977 letter from Mr. James T. McIntyre, Jr., Acting Director, OMB to the Honorable Jack Brooks) that "no claim of executive privelege will be made by reason of the transfer of functions to the President for redelegation." Brooks made some cogent observations in his report on the plan:[47]

> "The Office of Telecommunications Policy was established by a reorganization plan in 1970 to (1) serve as the President's principal adviser on telecommunications policy; (2) assist in formulating policies and coordinate the Federal Government's communications systems, including the assignment of radio frequencies; and (3) help develop plans and programs designed to take full advantage of technological advances. For many reaons, OTP has generally failed to live up to its expectations. As a consequence, the development of communications policy and enforcement of communications programs has not been effectively carried out."
>
> "Reorganization Plan No. 1 is intended to correct this situation by abolishing OTP, transferring certain of its functions to the President and transferrring others to the Department of Commerce. As originally

drafted, however, the plan was sufficiently unclear so that doubt remained whether the reorganization would resolve existing problems. In particular, the original plan did not clearly delineate between policy functions and operating functions, or the organizational structure intended to manage each. Also, while it appears to have been unintentional, the plan would have created a function that does not presently exist in OTP authority. During the amendatory period, these matters were cleared up to the point where serious conflicts should not arise. The plan as originally drafted transferred the following functions to the President: (1) preparation of policy options, particularly as they related to national security and emergency issues, (2) disposition of appeals from assignments of radio frequencies to U.S. Government stations, and (3) procurement and management of Federal telecommunications systems. The plan transferred the residual functions of OTP to the Department of Commerce. Although such functions were to be spelled out in an Executive order to be issued by the President subsequently, their scope could be reasonably anticipated by examining existing OTP functions prescribed in Executive Order 11556."

"By comparing the authority that was to be transferred to the President with that to be transferred to Commerce, it appeared that serious overlap and duplication could exist in the area of policymaking. This threatened duplication spelled future trouble, both in the sense that it could undermine what should be the intent of the reorganization plan and might adversely impact upon Federal procurement of ADP and telecommunications."

"In order to be effective there should be only one voice in the Executive establishment charged with making information policy, especially as that relates to ADP and telecommunications. Under the originally drafted reorganization plan, policymaking could have been divided between the President, who could reassign it where he chose, and Commerce. Such a potential division of authority was thought inadvisable in general and unacceptable as it related to the administration of Public Law 89-306. In consequence, the plan has been amended to provide that all policymaking functions derived from OTP shall be assigned to the President who may, in turn, reassign them only within EOP. It is expected that the President will combine these policy making functions within OMB. If another unit within EOP is contemplated, such must be accomplished by the enactment of legislation or a reorganization plan,

since the requirements of Public Law 89-306 can only be changed through the formal legislative process."

"Aside from policymaking, the initially drafted reorganization plan was also deficient in that it would have conferred new authority upon the President which he then could have transferred elsewhere. This grant of such authority, involving the procurement and management of Federal telecommunications systems was objected to for two reasons. One, it is not appropriate to utilize a reorganization plan to create new substantive authority. The Reorganization Act of 1977 provides that a reorganization plan may not have the effect of authorizing an agency to exercise a function which is not expressly authorized by law at the time the plan is transmitted to Congress."

"Second, and equally important, a grant of new authority in the area of procurement and management of telecommunications systems could interfere with, interrupt, and adversely impact upon existing authority, especially as such rests with GSA under Public Law 89-306, and with the Department of Defense. As in the above discussion on policymaking, it is not considered sound administrative practice to permit potentially disruptive and diverse actions to occur in operating areas of telecommunications anymore than they should occur in policymaking areas."

The redelegation of the authority formerly held by OTP was given by President Carter in Executive Order 12046 (see Appendix A),[48] with some functions being delegated to OMB and the Office of Science and Technology Policy (OSTP) while others were held within the White House. In December of 1979, the Secretary of Commerce (Dept. Organization Order 10-10) established the National Telecommunications and Information Administration (NTIA) and set forth its functions and scope of authority; and subsequently (Dept. Organization Order 25-7), described the organization and assignment of functions of NTIA.[49] The Assistant Secretary of Commerce for Communications and Information became the Administrator of NTIA. Some of the general functions and objectives set forth in Section 6 of Department Organization Order 10-10 included:[49]

06 Develop and set forth telecommunications policies pertaining to the Nation's economic and technological advancement and the regulation of the telecommunications industry.

07 Ensure that the Executive Branch views on telecommunications matters are effectively presented to the Federal Communications Commission and in coordination with the Director, OMB, to the Congress.

12 Participate with and perform staff services for the National Security Council and the Director, Office of Science and Technology Policy in carrying out their functions under Executive Order No. 12046.

13 Participate in evaluating the capability of telecommunication resources in recommending remedial actions and in developing policy options.

Neustadt[45] noted at the end of 1979: that the responsibility for domestic telecommunications policy rested with NTIA, that the responsibility for international telecommunications policy rested with the State Department, that OMB had the responsibility for Federal communications systems, and that the responsibility for national security telecommunications policy (discussed below) involved several departments and agencies. The net results of the reorganization was, despite Brooks' opinion that "There should be only one voice in the executive establishment charged with making information policy," to distribute responsibility for telecommunications policy. There was no single focal point for telecommunications policy in the Executive Branch.

Executive control of the nation's telecommunications in declared emergencies and war were assigned to the OSTP, the OMB was assigned policy responsibility for procurement and management of systems, and for reviewing the financing of the NCS. As noted above, all other OTP functions were assigned to the NTIA under the Assistant Secretary of Commerce for Communications and Information.

Thus, NTIA coordinated the preparation of the Carter Administration's position on revisions to the Communications Act of 1934. The NTIA Primer[50] contains reference to national security telecommunications, but the major emphasis is on the need for competition in the industry. This [illegible]consistent with the Administration's Domestic Policy Staff goals but [illegible]stent with the policy goals of the NSC. Reorganization Plan No. 3 of 1978 established the Federal Emergency Management Agency (FEMA),[51] and Executive Order 12148 transferred to FEMA

the civil NS/EP agencies along with the Defense Civil Preparedness Agency (DCPA).[52] FEMA's role in NS/EP telecommunications is still evolving.

One of the last bills signed into law by President Carter was PL96-511, "Coordination of Federal Information Policy." The implementation of this law could be very important to NS/EP telecommunications in the future. One significant immediate impact could result from the oversight authority granted to the Director of the new OMB Office of Information and Regulatory Affairs regarding the planning for (and conduct of) research with respect to Federal collection, processing, storage, transmission, and use of information (see Appendix A).

Thus, the organization and authority for telecommunications policymaking and development has been shifted back and forth within the Executive Branch repeatedly over the past 30 years. In large part, this is because it lacks a statutory basis. As long as it is not set by law, telecommunications policymaking and development will continue to lack a stable, long-term, institutional basis. This matter is currently under consideration by President Reagan and the new Administration.

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IV DOMESTIC TELECOMMUNICATIONS POLICY REVIEW

A. Foundations

The primary foundation of Federal regulation of communications common carriers lies in the Communications Act of 1934. Federal antitrust laws also play a major role in regulating the communications industry, primarily the Bell System. A review of domestic telecommunications policy must consider both communications law and antitrust law and the effects each has on the other.

The Communications Act of 1934 was primarily a recodification of existing law. It centralized, in the newly created FCC, regulatory and radio licensing authority over the common carriers. Previously, this authority had been divided among the Interstate Commerce Commission (ICC), the Postmaster General, and the Federal Radio Commission. Central to the development of common carrier policy in this country was statutory language in the 1934 Act that derived from the Interstate Commerce Act.

The Interstate Commerce Act of 1887 created the Interstate Commerce Commission and a mechanism for the economic regulation of the railroad industry. The 1887 Act did not extend ICC authority to the telephone or telegraph industries. The telephone industry first came under Federal regulation with passage of the Mann-Elkins Act in 1910, which brought telephone and telegraph rates under ICC authority. This authority was not the subject of hearings in either House, but rather was added to the Mann-Elkins Act by amendments offered on the floor of both Houses of Congress. However, a few years before Chairman Vail of AT&T had spoken out on the need for responsible regulation of communications.

The Transportation Act of 1920 (Esch-Cummins) expanded ICC regulatory authority over the communications common carriers to reach to all "transmission of intelligence by wire or wireless." The Willis-Graham Act of 1921 gave the ICC authority to approve or disapprove mergers of telephone companies. Such approved mergers were exempted from antitrust review. This law became Section 221(a) of the 1934 Act.

The Radio Act of 1927 created the Federal Radio Commission (FRC). Much of the policy debate surrounding this Act focused on the newly emerging broadcasting industry. The FRC also issued radio licenses to the common carriers. Section 13 of the Radio Act of 1927 specifically addressed the issue of competition among carriers. It said that "The licensing authority is hereby directed to refuse a station license...to any person...which has been finally adjudged guilty of unlawfully monopolizing radio communications...through exclusive traffic arrangements."

This section was the first Federal law to control entry into the domestic communications common carrier industry. It favored competition and directed its sanctions against monopolies, not against the builders of alternative networks. This section was carried over to the Communications Act of 1934 in somewhat modified form as Section 311 and was amended out of existence in 1952. Section 17 of the 1927 Act fostered diversity in international communications and is still part of the 1934 Act (Section 314).

In 1934, Federal authority over the communications industry was centralized in the FCC. The Communications Act of 1934 has two major regulatory titles. Title II sets forth the FCC regulatory authority over common carriers while Title III establishes FCC authority over radio spectrum users. By and large, Title II paralleled the railroad provisions of the 1887 Interstate Commerce Act as it stood in 1934. Title III followed closely the language of the Radio Act of 1927. But Title II significantly expanded Federal authority over communications common carriers by creating regulatory authority over the entry of new firms into domestic interstate transmission services distinct from the radio licensing authority.

In addition, Section 215 directed the Commission to investigate the common carrier industry and to recommend legislation.

The regulatory scheme of Title II of the 1934 Act had the following major elements:

- Federal regulation of interstate toll service;
- Rate and service regulation;
- Entry and exit regulation;
- Telephone company merger approval authority;
- The telephone investigation.

Amendments to Title II of the 1934 Act have added:

- Telegraph company merger authority;
- Regulation of pole attachments;

Let us look at each of these seven points in turn.

1. Federal Jurisdiction

The FCC was given authority over interstate long distance services. Sections 221(a) and 221(b) of the Act specifically reserved to state and local governments the authority over local rates. Congress was concerned about avoiding the development of a "Shreveport doctrine," in telephone regulation. Under the "Shreveport doctrine" the ICC had come to control almost all aspects of railroad regulation leaving little to the states.

While Congress could have given the FCC complete authority over the combined interstate-intrastate network, it did not choose to do so. Rather, the Federal regulatory jurisdiction was limited to interstate rates and facilities, and to items incidental to interstate communications. Notwithstanding the limitations in the Act, the courts have sustained the reach of Federal authority. For example, courts have upheld the FCC's authority to regulate the interconnection of terminal equipment even though that equipment is used primarily for intrastate communications.

2. Rate Regulation

All interstate carriers must file schedules of charges, setting forth rates and terms. Such rates and terms must be just and reasonable, with no unjust or unreasonable discrimination among customers. The Commission can accept or reject the rates and terms filed by the carriers or prescribe new rates and terms. In the absence of positive action by the Commission, the proposed rates go into effect.

3. Entry and Exit Regulation

Section 214 requires the FCC to authorize all construction of transmission facilities and reduction of service by carriers. Additionally, radio transmission facilities require a license that must be renewed.

4. Telephone Company Merger Authority

The 1934 Act carried forward the merger approval/antitrust immunity provisions of the 1921 Willis-Graham Act.

5. Telephone Investigation

Section 215 of the 1934 Act directed the FCC to investigate the telephone industry (which would naturally include Bell structure issues) and to recommend necessary legislation. In Public Resolution No. 8 on March 15, 1935, Congress directed the FCC specifically to investigate AT&T and appropriated $750,000 for the investigation.

The FCC investigation resulted in a report in 1939. The final report, although watered down from an earlier proposed report, still formed the basis for an antitrust suit brought by the U.S. Department of Justice in 1949. This suit led to the 1956 Consent Decree.

6. Telegraph Company Merger Authority

In 1943 Congress added Section 222 to the Act to allow the FCC to exempt the merger of the Postal Telegraph and Western Union Telegraph Companies from the antitrust laws.

7. Pole Attachment Regulation

In 1978, Congress added Section 224 to the Act to give the FCC authority to regulate the rates utilities charge cable TV systems for access to the utilities' poles and conduits where those rates were not state regulated.

This brief regulatory history of communications carriers suggests several points:

- There is a continuing tension between the industry structure and the antitrust laws.
- Regulation has served as an escape hatch from the antitrust laws on several occasions.
- Over the years the Federal Government has generally favored open entry and competition in both equipment and services from the invention of the telegraph to the present. Specific legislative action was needed to allow a merger of two competing telegraph carriers under the 1934 Act.

  There have been explicit entry controls only since 1934, and in 1948, 1971, and 1980 (as discussed below) the FCC found that the public interest was not served by preventing the entry of new firms into the transmission services market. The Federal Government has limited entry into the market for at most 46 of the 135 years since the telegraph's invention.
- Federal authority effectively reaches all parts of the communications carrier industry; but, Congress has chosen to leave local and intrastate regulation to the states.

B. Evolution of Policy Under the 1934 Act

The attached chronology lists key milestones in the development of the current national telecommunications policy. Few events are listed prior to 1934; many are listed after 1970. This disparity is not simply a result of the easier recall of more recent events. Rather, it is an accurate reflection of the increased legal complexity of telecommunications policy and increased activity in the last decade.

The key event of the immediate period following the enactment of the 1934 Act was the telephone investigation. A total of $1.5 million was spent by the FCC in a massive investigation of the Bell System. That investigation resulted in a long report in 1939 detailing the history and operations of the Bell System and recommended legislation giving the FCC additional authority over all parts of the system. The investigation probably contributed to the 1949 antitrust suit.

The evolution of policy is summarized in the chronology of Table IV-1.

1. Terminal Equipment Chronology

A separate chronology can be constructed showing just the major events in terminal equipment policy:

1956	Court reverses FCC in Hush-A-Phone Case, rules that customers have a right to use the telecommunications system in ways that are privately beneficial without being publicly detrimental.
1968	FCC issues Carterfone Decision, finding some AT&T tariff restrictions on customer use of terminal equipment to be unlawful.
	National Academy of Science studies interconnection, finds it to be technically feasible.
1972	FCC initiates Docket 19528, Joint Board Proceeding.
1974	Telerent Decision, FCC holds that "Federal exclusion of state law is inescapable" in terminal equipment. Upheld by courts in 1976.

TABLE IV-1

CHRONOLOGY OF TELECOMMUNICATIONS POLICY

1846	Invention of the telegraph
1876	Invention of the telephone
1893	Expiration of patents, growth of independents
1907	J.P. Morgan puts Vail in as chairman of AT&T (Vail calls for "One System, Universal Service")
1910	Passage of Mann-Elkins Act (rate regulation)
1913	Kingsbury Commitment
1920	Transportation Act of 1920
1921	Willis-Graham Act
1927	Radio Act of 1927
1934	Communications Act of 1934
1935	Public Resolution No. 8 (Telephone Investigation)
1939	Final Report of Telephone Investigation
1943	Sec. 222 added to Communications Act of 1934
1949	Federal Antitrust Suit Filed against Bell
1956	Hush-A-Phone vs U.S. decided
1956	Consent Decree Signed
1956	Docket 11866 Opened.
1959	"Above 890 decision" in Docket 11866
1968	Carterfone Decision
1971	Specialized Common Carrier Decision
1972	Domsat Decision (Multiple Entry)
1973	Computer Inquiry I Decision
1973	Value-Added Network Approval
1973	FCC Opens Docket 20003, inquiry into effects of competition policies
1974	Federal Antitrust Suit filed against Bell
1975	Registration Program for Terminal Equipment (Docket 19528)
1976	Resale Decision
1976	CCRA (Bell Bill) introduced in Congess
1976	FCC Issues first report on Docket 20003
1976	FCC Decision outlawing Execunet
1978	Sec. 224 added to Communications Act of 1934
1978	Court reverses FCC, allows Execunet
1978	FCC Opens Docket 78-72 (MTS/WATS) inquiry
1980	Computer Inquiry II Decision
1980	MTS-WATS Decision
1980	Competitive Carrier Decision

Terminal Equipment Chronology (Continued)

1975/76	Orders in Docket 19528 setting up registration program to protect the network from technical harm, while allowing widespread interconnection.
1976	Report in Docket 20003 showing no economic harm from terminal equipment competition.
1980	Final Order in Computer Inquiry II requiring detariffing of terminal equipment.
1980	AT&T announces reorganization effectively creating separate network and terminal equipment organizations.

The major event in the development of terminal equipment policy was the Hush-A-Phone court decision. Prior to 1957, AT&T tariffs barred telephone company customers from making "foreign attachments" to their telephone lines and instruments. One manufacturer of a foreign attachment, Hush-A-Phone Corporation, protested to the FCC about these tariff provisions. The FCC did not find these provisions unreasonable. Hush-A-Phone then appealed the Commission's decision to the courts and won. The U.S. Court of Appeals ruled that AT&T had acted unlawfully and that, generally, customers have the right to use the telephone system in any fashion that is privately beneficial without being publicly detrimental (Hush-A-Phone v. U.S., 238 F.2d 266 [D.C. Cir. 1956]). The Hush-A-Phone case was returned to the FCC, and the FCC struck down such general restrictions (Hush-A-Phone Corp. vs AT&T, 22 FCC 112 [1957]).

AT&T and the Independents changed their tariffs after the Hush-A-Phone decision, but continued to restrict customer interconnection of equipment. In particular, the carriers notified customers that their use of the "Carterfone" device violated the companies' tariffs.

The Carterfone manufacturer then filed an antitrust suit against AT&T. That antitrust suit was dismissed on the grounds that the FCC had primary jurisdiction over the issues raised by the tariff. So the manufacturer turned to the FCC for help. The Commission found, following the general rule laid down in Hush-A-Phone, that the tariff restrictions were unlawful and directed AT&T to file new tariffs.

AT&T filed new tariffs for interconnection that allowed acoustic and inductive connection under fairly free conditions, but that restricted electrical connection to carrier-provided devices to protect the network.

Some users and manufacturers found these restrictions burdensome and inefficient, and requested the FCC to move to a more efficient system. The FCC asked the National Academy of Science and Dittberner Associates Inc. to study the technical problems of interconnection. Both studies found that, with safeguards, interconnection was technically feasible.

In 1972, the FCC initiated Docket 19528 and a Federal-state joint board to look at the restrictions on interconnection. In 1975 and 1976 the FCC issued orders setting up a registration program that allowed customers to provide their own terminal equipment in almost every circumstance. The FCC's decision was appealed, ultimately to the Supreme Court, but was upheld.

So, by 1976, the rules for terminal equipment were fairly clear. Any manufacturer, foreign or domestic, who could meet minimum technical standards could sell voice and data equipment for direct connection to the telephone network. Additionally, the telephone companies could sell or lease terminal equipment to users as part of their regulated enterprise. The Bell System was further limited by the 1956 Consent Decree and by the FCC's computer rules (see discussion below). AT&T's operating companies were (and are) restricted by the 1956 Consent Decree to providing terminal equipment under regulation. And AT&T's manufacturing arm is limited to producing equipment of the type used by the operating companies.

The terminal equipment marketplace was unbalanced by this mix of regulation and non-regulation. Bell's competitors had the advantages of price flexibility, rapid introduction and withdrawal of products in the market, and the lack of universal service mandates usually imposed on utilities. AT&T had the advantages of marketing both communications services and the attached equipment.

Issues came to a head in the Dataspeed 40/4 Terminal case. In early 1976, FCC's Common Carrier Bureau, under delegated authority, rejected AT&T's tariff offering of the Dataspeed 40/4 data terminal on the grounds that such equipment was not properly communications under the 1934 Act. Ultimately, the Commission reversed its Bureau and the Dataspeed 40/4 became available under tariff. But the proceeding made a few points clear:

- For a variety of reasons the regulatory process can substantially delay the introduction of new products by regulated firms.
- There was a limit to the degree terminal equipment could be enhanced before such equipment was no longer communications equipment. For example, a computer with a modem installed is still a computer. A remote teller machine is a banking machine, not just a communications device.

Finally, in 1980, the FCC issued a report and order in Docket 20828 (the Second Computer Inquiry) that proposed solutions for many of the policy problems surrounding terminal equipment. Briefly put, AT&T was to separate terminal equipment sales and support from the operation and sale of basic (core network) communications services. In return, AT&T would be able to offer such equipment through a separate subsidiary without regulatory intervention. The FCC's decision was opposed by some, particularly Bell's competitors, and it is still in the courts. Bell, however, reacted by announcing a reorganization of the company along the lines required by the Second Computer Inquiry order.

2. The Future of Terminal Equipment Regulation

The broad outlines of future policy development with respect to terminal equipment policy appear to be rather clear. They are:

- Customer-provided terminal equipment will become the norm, not the exception.
- Bell (and other telephone companies) will separate their business equipment marketing from their basic network.

But the speed and the fine details of the evolution of this policy are unclear.

Customer-provided terminal equipment is widespread today. AT&T is selling some telephones outright at Phone Centers. AT&T has said that terminal equipment competiton is here to stay. The boundary between the telephone and other appliances, both in homes and offices, is breaking down. A variety of data and voice-data business terminals are on the market today. Zenith is selling a television set that includes a hands-free telephone.

Perhaps what is most unclear is the speed with which the Bell system moves towards a structure (such as created in Computer Inquiry II) better designed to cope with the new terminal equipment marketplace. Bell's competitors have filed suit to reverse Computer Inquiry II. Further, the reorganization required by Computer Inquiry II is massive. AT&T must deal with its ramifications or enter a period of confusion and ineffectivenes.

The Commission has ordered a gradual disaggregation of Bell's terminal equipment operations. New equipment, and all equipment tariffed on the Federal level, would be deregulated by mid-1982. Old, in-place equipment tariffed at the state level would be grandfathered and allowed to remain in place. If this schedule holds, by the mid-1980's AT&T's terminal equipment operations should effectively be separated from their basic network operations.

3. NS/EP Implications of Terminal Equipment Policies

Two areas of concern exist--standards and transition management. First, as a wide range of equipment is developed, many different communications standards are developing. This limits the electrical and logical connectivity of terminals and host computers. In addition, important NS/EP electrical standards, such as EMP protection, are not considered by the marketplace.

Second, the transition may be difficult. When a local telephone company has to "hand-off" a PBX customer to a separate subsidiary there may be a breakdown in service or support for that PBX. If the operating companies are *not* allowed to "*hand-off*" *in*-place customers to the subsidiary because of regulators' fears of anticompetitive effects, some customers--like remote defense locations--may find themselves with slowly vanishing or costly support for in-place terminal equipment. Either way, the growth of the separate subsidiary poses problems of insuring continuous, high quality support services for NS/EP terminal needs.

4. Evolution of Policies Regarding Transmission Services

As with terminal equipment, a chronology can be made of the key events in the regulatory policy surrounding transmission services. As with terminal equipment, most of these decisions occurred recently, rather than immediately after passage of the 1934 Act. A brief summary of this chronology is given in Table IV-2.

Radio-based communications are the underlying technology driving change in the transmission sector of the telecommunications industry. As early as 1948, the FCC issued private microwave licenses. And, in 1949, the FCC set aside radio frequencies for a new class of carriers--radio common carriers (RCCs)--who were to provide local distribution services in competition with the traditional telephone companies.

In 1959, the FCC decided to allow private microwave systems. It approved the request of Microwave Communications Inc. (MCI) for permission to offer specialized communications services in 1969. The Commission recognized such specialized carriers in 1971. In 1972, after considerable discussion, the FCC adopted an "open-sky" policy for domestic communications satellites. This policy allowed any financially sound and legal entity qualified for a radio license to build and launch a communications satellite and to offer communications service over that satellite. AT&T was restricted from using their satellite for private line services for three years. In 1973, the FCC authorized Packet Communications Inc. to offer a value-added or resale communications service.

Table IV-2

POLICY DECISIONS ON TRANSMISSION SERVICES SINCE 1934

1943	Passage of Section 222, allowing WU/Postal merger
1948	FCC issues experimental private microwave license.
1949	FCC allocates frequencies for public mobile radio, creating a new class of common carriers (RCCs).
1956	FCC initiates "Above 890" Proceeding
1959	FCC decides "Above 890", releasing frequencies for private microwave systems.
1963	MCI applies for license and authorization
1969	MCI granted
1971	Specialized Common Carrier Decision
1972	Domsat Decision
1973	First Value-Added Carrier Authorized
1974	FCC Orders End to Bell Refusal to Provide FX interconnection
1976	FCC Execunet Decision
1978	Court Finds FCC's Execunet Decision Unlawful, Reinstates Execunet
1978	MTS-Wats Inquiry Started
1980	MCI Antitrust Verdict
1980	Computer II Inquiry Decision
1980	MTS-WATS Decision
1980	Competitive Carrier Decision

The specialized carriers grew, but they encountered difficulties obtaining local distribution services from telephone companies. In 1974, the Commission ruled that local telephone companies must provide such facilities, including access to local switched distribution facilities for FX and CCSA private line services.

The specialized carriers were able to use this interconnection capability to offer a shared private line service. One such service, called Execunet by MCI, was in many respects quite similar to ordinary long distance telephone service (MTS). When Bell protested to the FCC, it ordered the specialized carrier to discontinue offering this service. MCI appealed the FCC order to the courts and won. The courts found that the FCC was trying to make the rules improperly.

In 1978, the FCC started a broad inquiry (the MTS-WATS inquiry) into whether or not ordinary long distance telephone service should be offered on a competitive basis. It concluded in 1980, that such services should be competitive.

At the end of 1980 several points were clear:

- No transmisson market was to be governed by a policy of closed entry.
- Owners of monopoly facilities, especially local distribution facilities, had to make those "bottleneck" facilities available to others, even competitors, under both communications law and antitrust law. Just how competitors can connect to the system, other than as a local user has not been adequately explored.
- Access fees for the use of local distribution facilities was the major remaining policy problem posed by competitive transmission services.

5. Access Fees/Separations and Settlements

One particularly thorny and still unsettled issue has arisen from the existence of interstate communications carriers offering services, like MCI's Execunet or SPC's Sprint, which compete with both ordinary long

distance service and private line services like FX. How should competing carriers be connected to telephone companies' local distribution facilities and how much should they pay for this interconnection? What are the system implications of proposed trunk side connections? What differences are permissible under communications and antitrust law between the access that AT&T operating companies provide their own long distance services and that which they provide to competitive carriers? The details of this debate are minute, confusing, and replete with acronyms and code words like ENFIA, FX, ONAL, and separations.

But the fundamental issues can be abstracted from the debate. It appears that some of the long distance services (including MTS) of the traditional telephone industry effectively "pay" about six cents per incremental minute for use of local, non-traffic sensitive facilities. Yet other services, like FX, effectively pay nothing. The competitive carriers would obviously prefer a lower price for the access they use. Access fees are sufficiently high that they form a significant part (about 30 percent) of the total cost of traditional long distance service. The revenue from access fees or their equivalent is an important part of the total revenues of local telephone companies.

Thus, the traditional telephone companies, operating in both local and long distance markets, are caught in a bind. If they lower access fees, for both their own and their competitors' long distance services, they increase the revenue required from local service if they are to cover all their costs. The local telephone bill must, in some aggregate sense, go up.

If they try to raise access charges to a uniformly high level, they face three major problems:

- Justifying the high rates for the different interconnection currently being made available to competitors;
- Dealing with many customers, like GSA and DOD, who are extensive users of the low-cost access sevices and who will resist the higher access fees;

- Dealing with the new competitors that will be created by maintaining access fees above marginal cost; in other words, "stand-alone" networks such as SBS and XTEN that do not require access to local distribution facilities.*

As a result of these and other factors, the major telephone holding companies like Bell and GTE favor lower access fees and more efficient schemes for pricing network usage, such as local measured service.

These changes will be difficult. The specialized carriers may be enjoying an artificial competitive advantage under the current access fee arrangements that more than offsets the competitive disadvantage created by a different interconnection. State regulators can be expected to oppose, indeed are opposing, any transfer of costs from the national level to their jurisdictions.

The FCC has begun an inquiry on access fees and has convened a joint board. It seems reasonable to expect that the access fee issue will remain at the heart of the telecommunications policy debate for some time to come.

6. NS/EP Implications of Access Fees

High access fees favor the growth of duplicative local facilities used for distribution of long haul traffic and of long haul networks not connected (or connected only loosely) to the basic network.

Lower access fees would facilitate a tighter economic and technical integration of all carriers with the existing telephone industry-switched local distribution plant. By making interconnection more common, low access fees would encourage the development of compatible standards in the communications industry.

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* It is likely, however, that systems like SBS will eventually go "off net" and interconnect with local carriers.

But the major impact of access fees on NS/EP needs is indirect and involves the number of carriers in the market. High access fees may fuel the growth of competitive intercity networks (unconnected at one or both ends) if the competing company can solve the local distribution problem and remain competitive. It is possible, although unlikely, that continued high access fees could force sufficient traffic off the traditional network to leave the traditional network in the situation of the railroads--in a long gradual decline characterized by reduced investment and an aging workforce and physical plant. This condition could be exacerbated if state regulators resist pricing that encourages efficient use of the local networks.

C. Bell Structure Issues

The proper structure and the rules for the competitive behavior of the Bell System continue to cloud communications policy. The 1934 Act directed the FCC to investigate the carriers' structure, internal dealings and the range of competitive activities. The FCC investigation, reported in 1939, is generally regarded as having led to the 1949 antitrust suit and subsequently tp the 1956 Consent Decree.

The 1949 antitrust suit was settled by agreement of both parties to a judgment with two key provisions:

1. The operating companies of the Bell System were restricted to offering common carrier communications services or services incidental to common carrier communications services. (Final Judgment in Civil Action 17-49, District Court of New Jersey, Paragraph V)

2. Western Electric was restricted to building equipment of the types sold to the operating companies (Final Judgment, Paragraph IV). Important exceptions to these general principals allowed Bell to do work for DoD (e.g., operate Sandia Laboratories) and to offer directory advertising.

There were also other, less important, clauses in the Consent Decree. For example, Bell was required to cross-license its patents and to share some technological information with U.S., but not foreign, firms.

The general philosophy of the Consent Decree could be considered inconsistent with the spirit of the antitrust laws and the legal underpinnings of the Communications Act. However, it fit well with the policy problems surrounding the Bell System structure in the 1930s and 1940s. It can be considered a two-way deal. AT&T would agree to being restricted to the regulated common carrier industry. In return, AT&T would be released in prescribed terms from the restraints of antitrust laws and even the threat of competition within its sphere of operation.

By and large, the FCC's actions have been consistent with the Consent Decree until recently. For example, in Computer Inquiry I (1973), it decided that AT&T should not be allowed to offer data processing services. It also decided that AT&T and other telephone companies should not offer cable television from their franchised local telephone companies. That is, AT&T was restricted to the regulated, common carrier sphere. Similarly, the FCC originally held, in both the Hush-A-Phone and Execunet cases, that AT&T's core market was to be protected from new entrants. In both of these cases, Federal courts reversed the FCC, finding that the law did not require or, in the specific cases, did not allow such protection.

Actually, however, the Consent Decree is a one-sided agreement. It binds Bell but it does not bind innovators outside the Bell System. The Consent Decree cannot revise the 1934 Act, which allows the FCC to introduce competition upon a finding that it would best serve the public interest.

All major recent legislative proposals dealing with common carrier industry structure, except for the 1976 CCRA or Bell bill, have proposed to eliminate the Consent Decree. The FCC, in its recent decision in Computer Inquiry II, may have found an approach to reducing the umbalances created by the Consent Decree. Final resolution of Consent Decree issues still rests with the courts or Congress.

Another way to look at these issues is to see how the Bell structure fits in with antitrust philosophy. In his book The Federal Antitrust Laws, Jerrold Van Cise offers one view of antitrust laws. He presents twelve rules of thumb to assist lay understanding of the antitrust laws. They are given in Table IV-3.

Only four of these rules of thumb (2, 3, 10, 11) seem to reflect major antitrust problems of AT&T today. The restructuring of Bell and the industry created by Computer Inquiry II and a move to an access-fee system would reduce or eliminate each of these antitrust problems. These conclusions are shown in Table IV-4. This analysis may reflect part of the logic behind Bell System support for some of the restructuring proposals.

Nevertheless, AT&T is currently mired in about forty antitrust suits. Most prominent among these suits is that brought by the Federal Government. As this is being written the Federal trial is in suspension as the parties try to work out a settlement agreement. In spring 1980, MCI won a $600 million dollar verdict against AT&T. This verdict, which when tripled totals almost two billion dollars, is currently being appealed by AT&T. Also in the trial stage is a suit by Litton Industries over terminal equipment practices. Southern Pacific Communications Co. (SPCC) has a suit against AT&T similar, in many regards, to the suit MCI won. MCI has a second suit, against both AT&T and the independent telephone companies, which attacks the current network planning and separations and settlements process as violating antitrust law. In addition to these major suits, there are about 35 lesser suits.

D. Legislative Activities

The last four years have seen the ferment in telecommunications policy spread to Congress. The telephone industry, concerned with the trend of telecommunications policy at the FCC, drafted legislation in 1976 that would have given it a monopoly over transmission services and would have restricted the emerging competition in the terminal equipment market. This legislation was introduced in both the House and the Senate, where it

Table IV-3

Van Cise's Rules of Thumb

Competitor Relationships

1. A corporation may meet with its competitors.
2. A corporation should not control its competitors.
3. A corporation should not conspire with its competitors.
4. A corporation should not unfairly compete with its competitors.

Customer Relationships

5. A corporation may select its customers.
6. A corporation should not dominate its customers.
7. A corporation should not unduly discriminate between its customers.
8. A corporation should not deceive its customers.

Corporate Relationships

9. A corporation may manage its corporate family,
10. A corporation should not monopolize the markets of its corporate family.
11. A corporation should not misuse the muscle of its corporate family.
12. A corporation should not indiscriminately multiply, through mergers with others, its corporate family.

Table IV-4

Bell System Alternatives and the

Antitrust Rules of Thumb

	A	B	C
Rule	Current Structure	Computer Inquiry II Structure	Computer Inquiry II Structure plus Access Fee (HR 6121)
2 and 3	Separations & settlements & network management poses a problem	Same Problem as in A	Problem Removed
10	Operating company procurement of both terminal equipment & network equipment is a problem	Problem substantially reduced; terminal equipment sold directly to users, not to service companies	Same reduction as B
11	Interconnection of local facilities with SCCs is a problem (e.g. MCI anti-trust verdict)	Same Problem as in A	Problem vastly reduced, but not eliminated

gained many sponsors. Hearings were held in the House in 1976 on what became known as the Consumer Communicatons Reform Act (CCRA) or "Bell bill."

Opinion was sharply divided on the merits of CCRA. It had few supporters outside the traditional telephone industry and it was strongly opposed by the FCC, which prepared a substantial study detailing the development of the telephone industry and the evolution of telecommunications policy. Ultimately, the 94th Congress ended without holding a mark-up of the CCRA in either House.

In the late fall of 1976, the bipartisan leadership of the House Communications Subcommittee announced their intention to rewrite the 1934 Act to deal with the problems created in all parts of the communications industry by the new technology.

The rewriting process was slow; 1977 was spent defining policy options and holding hearings on every part of the communications industry. In 1978, the subcommittee introduced HR 13015, which generally supported the concept of competition in telecommunications and tried to move to a more market-oriented, less-regulated industry structure. Hearings were held but no mark-up took place. In 1979, a new bipartisan bill was introduced in the House (HR 3333), and hearings were held.

Legislative activity also appeared on the Senate side. Two important bills were introduced in the Senate in 1979; one, S 611, by the Democrats and the other, S 622, by the Republicans.

In mid-1979, the House Communications Subcommittee scheduled mark-up on HR 3333. But, it proved impossible to move the bill, primarily due to divisions in the subcommittee over the broadcasting issues. The subcommittee leadership decided to separate out the common carrier issues and to treat those issues by themselves.

A new bill, HR 6121, was introduced in December 1979. But, it too proved difficult to move. It was not reported out by the full House Foreign and Interstate Commerce Committee until the end of July 1980, by a vote of 34-7. HR 6121 was then referred to the Judiciary Committee, which ultimately reported it out too late in the session for further action. The Committee expressed considerable concern over what effect such legislation would have on the ongoing AT&T antitrust suit and the propriety of congressional action on any major legislation that affected Bell System structure while the antitrust case was before the courts.

A bipartisan bill, S 2827, was introduced in the Senate in 1980, but no mark-up took place.

The 1980 elections changed the shape of communications politics in both the House and the Senate. With the Republican takeover in the Senate, the Commerce Committee majority became one whose legislative philosophy was closer to that of the House.

Every bill mentioned, except CCRA, would have deregulated terminal equipment. Every bill mentioned also could have encouraged competition in intercity transmission services. The bills differed in their treatment of the Bell System: some bills either handicapping Bell or restructured its network services; others separated regulated from unregulated services, but left Bell relatively free in both spheres.

By the end of 1980, there were two primary issues in domestic communications: the access fee and the Bell System structure. The access fee--the mechanism to replace separations and settlements--is intimately tied to local rates, the authority of state regulators, and the profits of small rural telephone companies. Bell System structure is a matter of intense concern to AT&T, the Judiciary Committees, the Department of Justice, and many of Bell's competitors and customers (including NS/EP customers).

Given the stakes and the players, these two issues will probably continue to be at the heart of the conflict over communications legislation in the 97th Congress.

E. Analysis of Explicit NS/EP Provisions in the Communications Act of 1934, HR 6121 (96th Congress), S 2827 (96th Congress)

The 1934 Communications Act has only a few specific references to NS/EP needs. However, it frequently requires the FCC to serve the "public interest." Its statement of purpose includes a reference to the "national defense," a reference that was not in the President's request for enactment or in the bill as it was introduced. It was added in committee in the Senate.

Title II has only two references to NS/EP needs. It requires the FCC to notify the Department of Defense of plans by carriers to expand facilities or to discontinue services, as well as the intention of telegraph carriers to merge.

Section 606 essentially allows the President to exercise the FCC's powers during war or a declared national emergency.

1. HR 6121 /96th Congress

HR 6121 would have amended Title II of the Communications Act of 1934. It would have addressed NS/EP needs through Section 201, where one of the common purposes of the Act was:

> "to assure that all the people have available ... telecommunications services, facilities and products...which promote the national defense and security and emergency preparedness of the Nation."

Section 212(A)(2) would have given the FCC authority to "establish standards and take other appropriate action to promote the national defense and security and the emergency preparedness of the Nation" with regard to all carriers--including otherwise deregulated carriers.

This authority was broad and essentially unrestricted in the NS/EP sphere of interest.

Section 255 dealt with network planning. It set up a mechanism for network planning meetings. It was specifically designed to deal with the problems of coordinating parallel (competing) networks and generally did not apply to partnership arrangements in the planning of interconnection of non-competitive facilities (e.g. long-haul intercity carriers and local-loop service providers).

In Section 255(c)(2), the bill would have given the Commission authority to order such network planning meetings for NS/EP needs. Section 280 gave the President the authority to require any carrier (including a deregulated carrier) to provide service. This authority was conditioned upon a test of need and market failure. This section of the bill was based upon and closely paralleled language provided by the administration, which had been cleared through OMB.

HR 6121 would have left Section 606 unchanged, except for slight technical amendments.

2. S 2827/96th Congress

Sponsored by the bipartisan leadership of the Senate Commerce Committee and its Communications Subcommittee, S 2827 also addressed NS/EP needs.

The bill would have dealt with NS/EP issues in a fashion similar to HR 6121. but in less detail and with less specific authority or responsibility for NS/EP needs. S 2827 would have amended the purposes of the 1934 Act, leaving the "national defense" and "safety of life and property" language unchanged.

S 2827 set forth general common carrier policy, but without mentioning NS/EP needs. Similarly, the bill's authorities section contained no specific NS/EP clause.

S 2827 would have given the FCC the authority to coordinate, not require, the development of backup, restoration, and interconnction arrangements. The bill also would have given the President authority to require service from carriers as in HR 6121. It would have required the President to coordinate any government program for communications survivability. Such a program was to be open to any carrier "willing and able" to participate. S 2827 left Section 606 of the 1934 Act unchanged.

Table IV-5 shows specific NS/EP aspects of the 1934 Act, S 2827, and HR 6121. As can be seen, there are considerable differences among the three.

F. Conclusions

Competition with the transmission services of the telephone system, approved by the FCC and authorized under the 1934 Act, is more than 30 years old. Competitive intercity facilities have been the general policy for more than 20 years. During the last 10 years, new intercity competitors have grown substantially. Today, many firms once locked into a small niche of a more rigidly structured communications industry are expanding into all parts of the market. The competitive intercity carriers include GTE and Continental Telephone Company, once active in communications services only through their local operating companies. The competitive intercity carriers also include firms like ITT and RCA, which traditionally restricted themselves to international services. And new firms, with major corporate financial backing, including Southern Pacific Communications Company, Hughes, SBS (a partnership of IBM, Aetna, and Comsat) and XTEN (XEROX), are now going after the communications service markets.

Given the nature of the U.S. political process, transmission services will probably not go back to the quasi-single supplier environment that existed before 1950. The experience of the Bell bill illustrates the insurmountable obstacles such a proposal would encounter. In the days of the Bell bill the stakes for the opponents were far smaller; the

Table IV-5

NS/EP Aspects of Existing and Proposed Legislation

Aspect	1934 Act	S 2827	HR 6121
NS/EP Purpose in Section I	yes	yes	yes
NS/EP Purpose in Title 2	Subsumed in "public interest" standard	no	yes
NS/EP Authority in Title 2	Subsumed in general authority	no	yes
Mandatory Service for NS/EP Needs by Presidential Order	Only during war or declared emergency	As in 1934 Act or upon meeting strict "reasonableness test"	As in 1934 Act or upon meeting strict "reasonableness test"

traditional telephone industry was far more united than it is today; Congress and the FCC were less educated on the issues; and the traditional industry, (Bell, the independents, and the unions) all pushed hard. Yet, the Bell bill did not even come to a vote in subcommittee in either House.

In terminal equipment, the case is even clearer. A variety of equipment is directly connected to the network. A monopoly supplier could no more effectively meet this fragmented demand than could an electric company hope to design and build every type of electrical appliance.

Given that competition is here to stay in every aspect of the communications equipment and service markets, what can we see of the future for NS/EP needs?

First: Transition. The major supplier of communications services, the Bell System, will undergo substantial reorganization--a process that has already begun. The communications marketplace will evolve rapidly. The number of supplies will increase as an increasing variety of telecommunications products and services become available. It is quite possible that during this transition, NS/EP needs will be overlooked or ignored by the carriers. The procurement of NS/EP telecommunications will become more complex.

Second: Adaptation. Mechanisms for meeting NS/EP needs will change. The traditional carriers will be unwilling to bury any costs in their capital plant, if that makes them less competitive. They will be unwilling (or unable) to spend money they cannot recover. Mechanisms must be developed to deal with NS/EP needs that can be met only if all carriers are required (or induced) to work in unison.

Meeting NS/EP needs in the new environment presents new challenges. These challenges must be met and overcome.

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V OBSERVATIONS ON INDUSTRY TRENDS

A. Purpose

Through technological change, entreprenuerial pressure, court decisions, and FCC actions, the telecommunications market is opening up in all areas of communications, except perhaps local (wired) distribution.* In noting these regulatory and competitive dynamics, however, it is easy to ignore the major role that remains with the established common carriers (ECCs).

B. An Important NS/EP Impact of a Dominant Carrier

To gain a more quantitative picture of the roles played by the common carriers and how those roles are expected to change over the next 10 years, current and projected revenues for services and equipment are given in Figures V-1 and 2.[1] Figure V-1 shows the revenues from telecommunications services by type of carrier. The total growth is expected to increase at a 12 percent annual rate, but the Bell System's share will decline from 80 percent to slightly less than 70 percent.[1] The aggregate services revenue projected for ECCs in 1990 is more than 80 percent of the total. Breaking those revenues down, Figure V-2 shows the extent to which the ECCs dominate individual service segments. Thus, while much general attention is given to the other common carriers (OCCs) and interconnect competition, this dominance by the ECCs is likely to remain for some time. That is not to say, however, that the major changes discussed in Chapter IV may not have important NS/EP significance.

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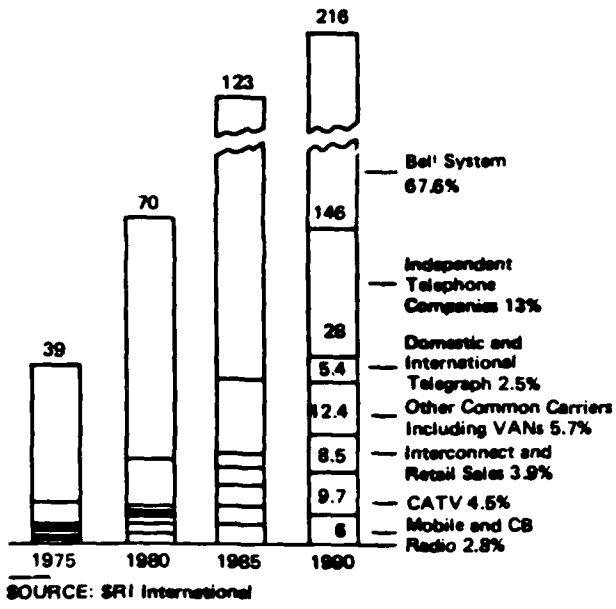
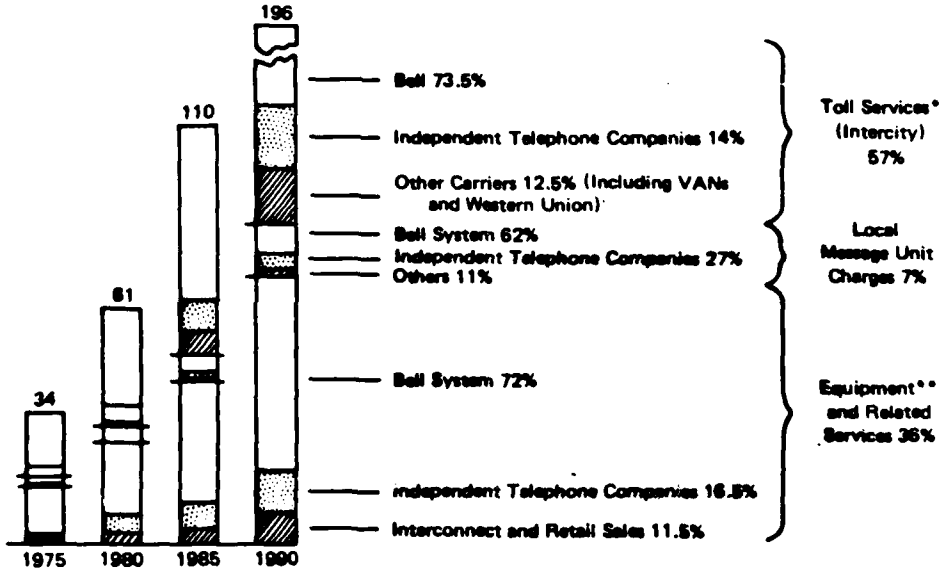
* An official of NTIA was recently quoted in the press as also favoring competition in the local distribution segment of the industry. Also, there is a growth in the provision of non-video local cable services and the FCC has released frequencies for systems like XTEN which by-pass the local distribution system.



SOURCE: SRI International

Figure V-1 TOTAL U.S. TELECOMMUNICATIONS SERVICES REVENUES
(Billions of Dollars)



* Starting in the mid-1980's these revenues will include both local access and interexchange charges.

** Includes local flat rate charges.

SOURCE: SRI International, Department of Commerce

Figure V-2 DISTRIBUTION OF MAJOR DOMESTIC TELEPHONE REVENUES
(Billions of Dollars)

If one assumed that the ECC share of the market decreased gradually but that the major carriers, particularly AT&T, continued to pursue a competitive edge, there might be little increased concern for NS/EP communications. A new equilibrium might eventually be reached, but the ECCs would still hold a substantial share of the market, and the Bell System would remain the major carrier. The significant impact would occur, however, when the major carrier changes its commitment, for whatever reason, to the continued support and improvement of the public telephone system. In other words, the ECC's commitment to public services as a regulated utility could undergo change in a competitive environment. Then a potential threat to NS/EP telecommunications may exist and must be considered.

While it may seem highly unlikely that AT&T, the world's largest company, would ever be inclined to alter its public service role or its commitment to a well-run telephone system, certain corporate decisions could have that impact. Certainly AT&T's government contract work has decreased. The Federal Government now specifically pays for some work whose cost used to be part of the overall cost of a service. Further, ATT's protective construction program has been discontinued. The interconnect decisions now mean that customers arrange for maintenance of equipment on their premises. In response to the Second Computer Inquiry, AT&T must separate the sales of terminal equipment from basic core network services (see Chapter IV).

A natural concern arises as to how commitment to public service can be maintained. Adjustment of the rate base to yield a competitive return for profit and reinvestment purposes has traditionally met this need, but under more monopolistic circumstances. In the presence of competition and unbundled and allocated costs, adequate rates may be somewhat harder to establish. If profits are low, reinvestments in plant are curtailed and the system can be expected to degrade. Furthermore, regulatory action can not always be relied on to continue a service.

C. An Example of Industry Development

Much of the decrease in ECC dominance of the industry can be attributed to, first, a few small companies wanting to get into the lucrative terminal and intercity carrier markets; and, later, the entry of larger corporations, often bringing new technology and services (see Chapter IV). Table V-1 outlines the spectrum of company types that have emerged and illustrates several alternative sources within each type.

Much of the anxiety in the NS/EP community stems not only from the perceived threat of a Soviet attack, but also from potential impacts of competition and deregulation, particularly as they affect more fundamental, architectural, or system-level operation and planning of the telephone system. So far competitive practices have emerged in the transmission and terminal segments, to a small extent in the switching field, and local distribution in the form of an increasing number of radio common carriers.

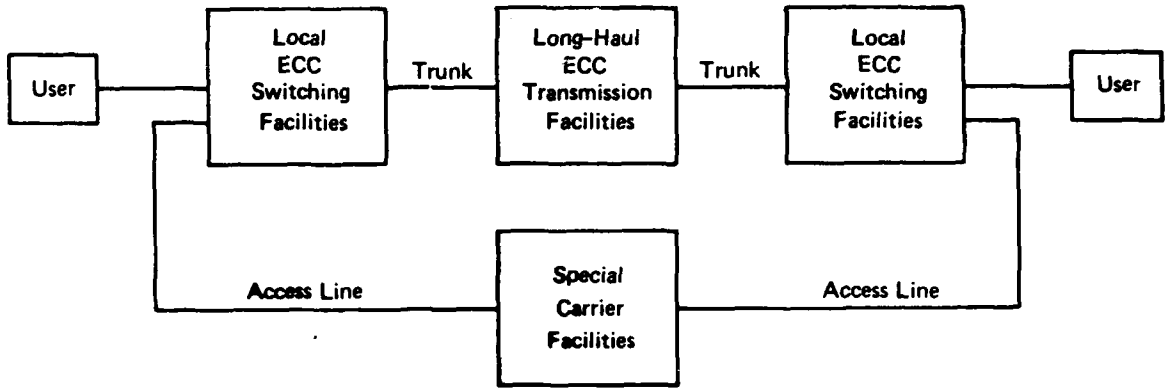
To give some feeling of how interrelated the special and existing common carriers can become, consider the intercity carriers. The specialized common carriers, offering alternative intercity trunking, have interconnected with the local telephone companies via access lines as users of the telephone system. This arrangement is illustrated in Figure V-3(a). The user must dial extra digits to identify the OCC trunking arrangement and to permit billing. Under this plan, the other common carrier requires no signalling transmission or numbering plan unless his own trunking system eventually involves switching.

The following example illustrates the complexities that arise as competitive services become more integrated into the system. Negotiations were opened to explore how to treat the OCCs' share of the local exchange costs that get transferred to the interstate jurisdiction. One suggestion advanced was to use the arrangement shown in Figure V-3(b), where the OCCs and ECCs are connected to the local facilities on an equal basis. This greater equality, however, has some important ramifications. If customers dial only the usual 10 digits, the only way to route calls onto the OCC trunks would be to recognize, at the local office, subscriber lines

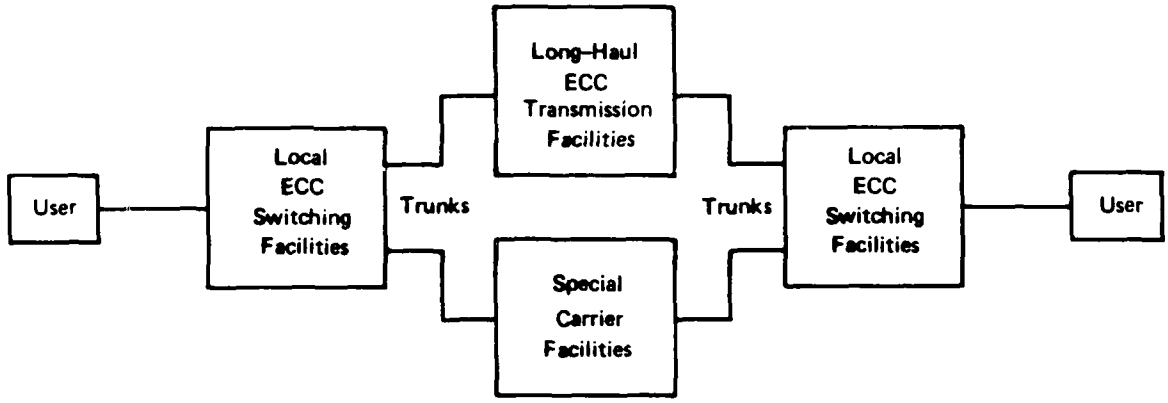
TABLE V-1

Spectrum of Telecommunications Companies

Type of Company	Types of Services Offered	Examples
Existing Common Carriers	ETE voice circuits ETE TELEX, TWX	AT&T, BSOCs, GTE, Continental, WU
Other Common Carriers		
Special	Intercity trunking, dial-up voice	MCI, SPC, ITT
Satellite	Intercity trunking	WU, RCA, ASC, AT&T, GTE
VANs	ETE data, electronic mail	Tymnet, Telenet, ITT, Graphnet
Comprehensive	ETE data, voice, conferencing,	SBS, XTEN
Radio	Radio paging, radio telephone	Radio Relay Corp. Industrial Communications Systems, Air Signal
Interconnect Equip.	Terminal equipment, PBXs	WE, Northern Telecom, Rolm, GTE, ITT
Switching Equip.	Central office switches	WE, Northern Telecom
Transmission Equip.	Microwave, wire-line equipment	WE, Farinon, Avantek

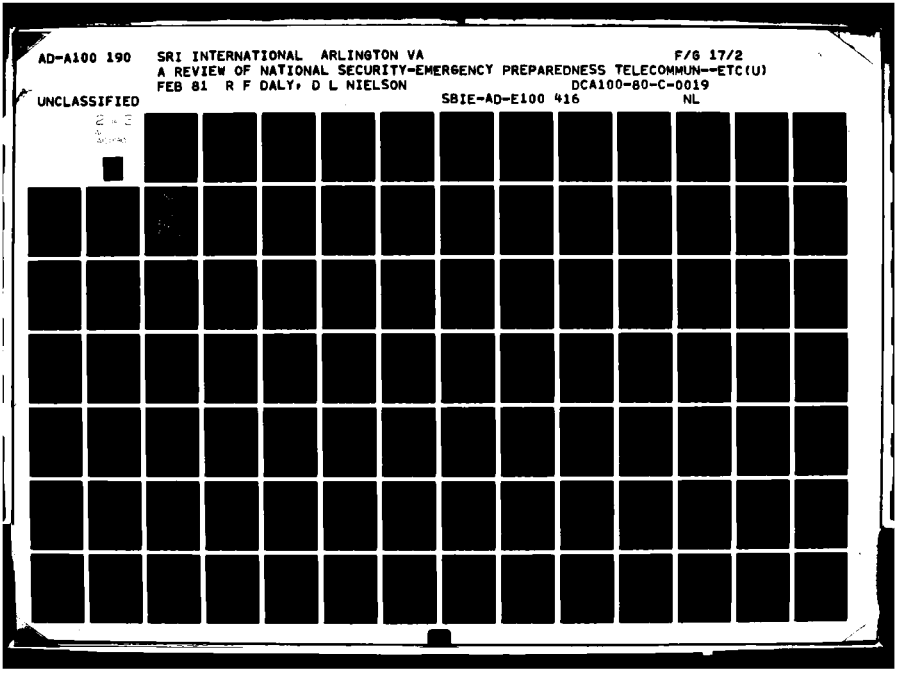


(a)



(b)

Figure V-3 TWO EXAMPLES OF A SPECIAL CARRIER INTERFACE TO THE ECC SYSTEM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NL

requiring such routing. Without a means to recognize such subscribers and if alternate trunking arrangements exist out of the same local exchange (each offering different rates) then customers must use extra digits to search out the preferred (e.g., most economic) route.

If subscribers cannot select the desired carrier, then all carriers would eventually charge the same rates.* Since not all may have the same costs, it would be difficult to ensure equitable profits. To generalize, as the OCCs become more indistinguishable within the system they tend to lose their competitive advantage. Also, when OCCs directly depend on the established system they have a stake in its maintenance and future planning.

This could cause decentralization of network planning and control, a matter of keen interest to the NS/EP community. If the OCC share of the market remains small, then the status quo regarding network signaling and control will likely continue. If the OCC market share increases considerably, then either they (individually or collectively) must create their own efficient switching and trunking plan (compatible, at least at the interface, with the existing one) or else become indistinguishably integrated into the present system.

D. Sources of Government Communications

As shown in Figure V-4, there are five sources of communications facilities in the United Sates that are of potential use for national security purposes. With one exception (the privately-owned system) these facilities are used to provide systems and services for the government, public, and private sectors. Figure V-4 also shows how the Federal Government gets its services from four of the sources and how the categories of facilities are interrelated.

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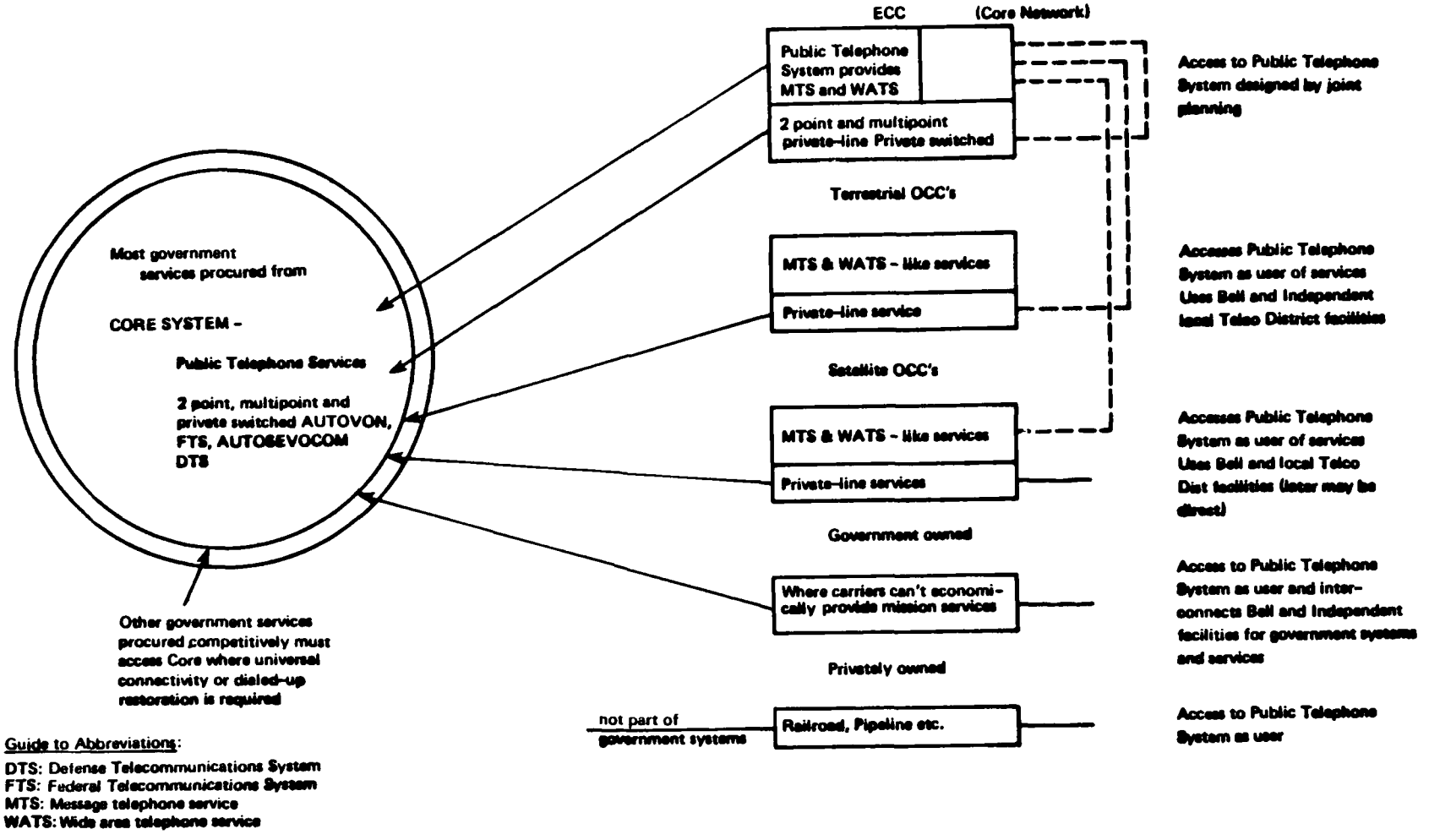
* This implies the use of some scheme to allocate the market. Although market allocation occurs for some international record communications originating in the United States, its application to intercity communications would appear unlikely.



Guide to Abbreviations:

DTS: Defense Telecommunications System
FTS: Federal Telecommunications System
MTS: Message telephone service
WATS: Wide area telephone service

Figure V-4 SOURCES OF GOVERNMENT COMMUNICATIONS SERVICES

Most services are procured by each government department and agency based on individual requirements, except where common user systems like the Federal Telecommunications System (FTS) provide services for all. A third factor is that these services are now procured without consideration of the overall system plan. Many are mission related and perhaps should not be part of a larger system. Further, many of these services are procured competitively from among the various common carriers in accordance with OMB procurement policies.

Planners of national security telecommunications systems must interact with the departments and agencies to create a system concept that will include communications services appropriate to their needs. These planners must also deal with both the established and other common carriers at the system planning level to interrelate the communications needs of each department and agency to an overall system concept.

REFERENCES

1. Korek, Michael and Ray Olszewski, "The Changing Structure of the U.S. Telecommunications Industry," SRI International Business Intelligence Program, Rpt. 622, SRI International, Menlo Park, Ca., Dec. 1979.

VI TECHNOLOGY AND EMERGENCY COMMUNICATIONS

A. The Common Carriers

The public telephone system--the Bell system and about 1,600 independent companies--is vast. Route miles are counted in the millions and telephone channel miles in the high hundreds of millions. There are nearly 27,000 switching centers, ranked in a five-level hierarchy. There are 10 regional centers (Class 1 offices) in the United States and two more in Canada. There are about 50 sectional centers (Class 2 offices), 160 primary centers (Class 3), 1,600 toll centers (Class 4), and 25,000 end offices (Class 5) including community dial offices (CDOs). There are also approximately 125 junction offices, serving as convenient tie points outside large urban areas. The upper levels in the hierarchy principally offer alternate routing when it is economically efficient and only for long distance calls. Within metropolitan areas interexchange traffic does not follow the hierarchial organization.

In addition to the direct dial telephone system, the carriers also lease transmission facilities to customers on a point-to-point and multipoint basis. A variety of offerings are available to serve voice, data, TV and radio, and other requirements.

The long-distance transmission system is predominantly analog--and it will remain so for many years to come because of the billions of dollars invested in analog equipment. Digital-switching centers are very slowly replacing the older electro-mechnical switching centers, but it will be at least 10 years before a significant fraction of the end offices have digital switches.

Considering the number of independent companies involved, the variety of switching systems, and the many different signaling methods, it is amazing that the telephone system not only works but works very efficiently. The monopoly status enjoyed by the established carriers permitted orderly planned growth, along with nationwide standards that provide what appears to be a single integrated system.

Most other common carriers either serve localized areas or (via satellite, especially) have only a few, sparsely-located terminals. Specialized common carriers have a total of hundreds or more microwave stations (usually in the 2- to 6-GHz band) with the usual complement of multiplex equipment at drop points and microwave relay repeaters elsewhere. Perhaps the only unique features distinguishing one system from another are their individual routing and areas of coverage.

Three specialized common carriers and one telegraph carrier operate rather extensive microwave communications systems:

- MCI Communications Corporation and its subsidiary MCI Telecommunicatons Corporation have one network extending from coast to coast. This system has nearly 200 nodes distributed through 19 states. A second network is a mid-continent, north-south system having 83 nodes in nine states.

- Southern Pacific Communications Company and its Subsidiary Transporation Microwave Corporation have an extensive transcontinental system with approximately 400 nodes in 25 different states. A second system is concentrated in the industralized northeast, having 60 nodes in five states.

- U.S. Transmission Company has a system predominately in the southeast, ranging from Houston to New York. The routing generally avoids urban areas. There are 106 nodes in 12 states.

- Western Union Corporation and its several subsidiaries have a backbone network linking the coasts with spurs to intervening major cities. Three parallel paths exist between the east coast and St. Louis and Chicago. Others link Omaha to Denver and Seattle to San Francisco. Still another system links a series of cities within Texas. Routing carefully avoids urban areas as much as possible. There are 425 nodes.

B. Directions of Technology

With the advent of solid state technology, digital circuits, and digital encoding, a major evolution in telecommunications facilities is taking place, affecting all areas of telecommunications--switching, transmission, and signaling. The predominantly analog facilities developed

over the last 100 years will gradually be replaced with digital facilities. However, since the plant facilities represent an investment of more than $125 billion, total conversion must take place over several decades.

1. Trends in Switching

The evolutionary development in switching can be seen as progressing in two phases. The first started with the introduction of computer techology into the common control equipment of space-division switches, also known as stored-program-control switches. The common control processor is used together with established crossbar switching technology and reed-relay switching matrices.

The second phase led to the all-digital switches like Bell's ESS 4, GTE's EAX series, and similar developments from various other manufacturers. The switching matrix on these newer switches were space division, time division, or sometimes a combination of both.

In addition to the advantages of greater flexibility in operation and features, digitial switches require less space and are less costly to maintain owing principally to solid state technology. However, in spite of their cost advantage, the sheer volume of 27,000 central offices of all sizes in the U.S. telephone network makes it impossible to convert the system in a short time. The Bell System has only one digital switch in production, the ESS 4, which is suitable only for large toll offices. Thus, converting to digital switching in the Bell System is constrained to replacing Class 1, 2, and 3 offices for the present. At the current rate of installation (18 per year), that will take about 15 years.

The depreciation life on some crossbar switches was shortened to help finance the conversion. In the Class 5 and the smaller Class 4 offices, less than half of the switches are of the common-control type, and less than half of these are ESS switches; none is fully digital. It will take more than 20 years to convert all of the existing switches to digital machines.

Another development that could influence the conversion to all-digital switching is the advent of distributed switching. Telephone companies presently have remote switches handling from a few hundred up to a thousand subscribers. The remote switch is controlled by a main switching machine in the central office. This trend could lead to small independent digital switches distributed throughout a service area. Their prime role could be concentration for small groups of subscribers, but they could also play important roles in local switching for larger and more closely associated groups of subscribers.

2. Trends in Transmission

The short-haul, interoffice transmission facilities were the first to use digital carrier systems. The T1 carrier system took advantage of the inherent capability of existing cable facilities to operate at a much higher bandwidth than required for a single voice circuit. More recent versions of the T-carrier system provide 48 voice channels over the same wire pair that formerly could carry only one channel. Generally, the conversion of interoffice trunks to T carrier is progressing at a rapid pace throughout the nation's telephone network.

Of particular interest for the next 10 years will be the rapid introduction of fiber optics in the short-haul (and more slowly in the long-haul) transmission facilities. Fiber optics offers a very large bandwidth and, with continuing progress in fiber optics technology and declining prices, fiber optics will be introduced at an ever-increasing rate in interoffice transmission facilities.

Digital microwave represents another means of short-haul communications for interoffice trunk facilities. Recent improvements that allow transmission rates of up to 4 bits/Hz make digital microwave systems competitive with conventional analog facilities.

In the past, Bell's long-haul transmission facilities have been analog, and there is little [illegible] will change much in the next 10 years. This is [illegible] existing microwave facilities are being

converted from FM to single sideband transmission. This conversion will more than triple the number of channels available from the existing analog systems. Since conversion can be accomplished at a lower investment in capital equipment at present, there is no economic advantage in introducing digital microwave systems for long-haul use. However, fiber optics will play an increasing role in long-haul communications in the next 10 years. The first long haul fiber optics system is being installed by AT&T between Boston and Washington, D.C. Ultimately, some of the older coaxial systems could be overlayed or replaced with digital fiber optics systems.

A paradox has developed within the national telephone system. The long-haul transmission facilities are analog and the major switches interfacing with them are going to be predominately digital ESS 4 switches. On the other hand, the short-haul transmission facilities will be predominantly digital with the local switches remaining analog for many years.

3. Interswitch Signaling

Since the development of the telephone, signaling [illegible] many slow evolutionary changes and numerous variations [illegible] approach have developed.

The most recent development is common channel signaling. This deviates from the established practice, in which each voice channel has its own built in signaling facilities. With common channel signaling, a separate data channel is used to transmit signaling information for several trunks simultaneously. This development is still in a state of flux and several approaches are being used throughout the world. In the approach beginning to be used by the Bell System, a separate data network is created for transmitting the signaling information independent of the specific trunks served--20 switches will use that network to control the routing of calls by all other class 1-4 switches. This has been labelled common channel interoffice signaling (CCIS).

Common channel signaling essentially provides a capability for enhanced information transfer between switches. This added capability can be used to transmit per-call information, traveling class marks, and routing and control information unique to each individual message, thus making possible new and improved customer services. In addition, common channel signaling can make the telephone network more efficient by transfering network and management information; e.g. call setup time can be reduced from more than 10 seconds to 1 or 2 seconds per call.

4. System Architecture

The telephone [illegible] a modified hierarchial network that is defined by [illegible] of links between offices and the switching [illegible] is a circuit-switched system, including even the virtual [illegible] switching accomplished in the digital machines. The management and control system used by the telephone systems is also hierarchial; it is centralized, but in a number of locations. For maintenance and control of wideband facilities, there is a trend toward decentralization of the traffic control by embedding it in Number 4 ESS switches, but there is still a national center for monitoring and controlling traffic throughout the entire network. The trends are toward greater concentration of traffic per facility and concentration of facilities in major metropolitan areas near their markets.

Telephone system architecture is headed toward functional centralization and automation. The trend is toward unmanned switching facilities with control of a number of different switches from some common location and unmanned wideband transmission facilities with a single control point for an entire region. Further, all sensor information is brought into a computer, with only exception-reporting going to the operators.

C. Dependence On The Common Carriers

The common carriers are the primary element of the national telecommunication networks serving emergency systems, primarily the Bell System and the independent telephone companies. However, other carriers like Western Union, COMSAT, and RCA also play significant roles. Many smaller elements of the network also play important roles in emergency communications, but will not be considered here.

Most emergency communications systems are designed for a single purpose. The aircraft distress system, for example, has VHF radio transmitters/receivers at many locations so that any plane with an emergency can communicate with one or more of them. Those radio facilities are devoted exclusively to that emergency system. However, the system is incomplete unless communications with those facilities are extended to a Federal Aviation Administration (FAA) control center where an operator can listen to the distress call and respond. Leased telephone lines from the remote radio sites to the FAA control centers provide those links. Hence, while FAA owns and operates the control centers and radio sites, it depends completely on the common-carrier transmission facilities for the aircraft distress system to function.

Many other large emergency systems, such as AUTODIN and AUTOVON, depend almost totally on the common carriers for all their facilities. The analysis of existing emergency systems has not been exhaustive because they are so numerous. Particular emphasis has been given to Federal emergency systems since their performance affects the lives and property of everyone. The analysis is summarized in Table VI-1. Entries under the columns of specific communications requirements indicate whether the emergency system named in that row depends on common carriers to satisfy that requirement. The conclusion is rather obvious: almost every system does depend in some manner on the common carriers.

The only systems not dependent on the common carriers are the point-to-point elements of larger emergency systems. For example, the VHF/UHF radio communications directly between airborne command posts via

Table VI-1: Dependence on Common Carriers

Existing Emergency Systems	Access	Routing	Transmission	Interoperation	Support Services
AFOS	yes	no	yes	no	yes
AUTOVON	yes	yes	yes	yes	yes
AUTODIN	yes	yes	yes	yes	yes
CDNARS	partial	no	no	no	partial
CDNATS	yes	no	yes	no	yes
CDNAVS	yes	yes	yes	yes	yes
Emergency Medical	yes	yes	yes	yes	yes
Emergency Fire	yes	yes	yes	yes	yes
Emergency Police	yes	yes	yes	yes	yes
FSTS	yes	yes	yes	yes	yes
FTS	yes	yes	yes	yes	yes
IEMATS	yes	yes	yes	no	yes
JCSAN	yes	yes	yes	yes	yes
Marine and Aircraft Emergency Radio	no	no	yes	no	yes
NADIN	yes	no	yes	no	yes
NAWAS	yes	no	yes	yes	yes
Nuclear Powerplant Emergency	yes	yes	yes	yes	yes
REWARC	yes	no	yes	no	yes

line-of-sight transmission are independent. However, to extend their range beyond line-of-sight, they require either airborne relay or communication with ground entry points and connection via telephone lines--a partial dependence. The FEMA HF radio system, CDNARS, has a number of elements of the system that are point-to-point and independent. However, some high-powered transmitter sites are physically remote from the receiver sites and use telephone lines for interconnection--again, a partial dependence and a vulnerability to the extent that the carrier facilities are vulnerable.

In summary, almost all existing and planned emergency systems depend totally on services and facilities provided by the common carriers. This dependence is of concern only to the degree that the common carrier systems are vulnerable to damage or breakdwon during emergencies.

D. Vulnerability of the Common Carriers

Centralization of functions is a poor practice if communications are to be available during major emergency or crisis situations. Consider, for example, AT&T's implementation of common channel interoffice signaling. Each of the ten regions has two signal transfer points, each located in a major metropolitan area. If both points in a region are damaged, long-distance dialing for an entire region is lost. The loss of just 20 facilities destroys the entire long distance telephone system in the United States.

Centralization of network management also makes the common carriers vulnerable. Network records are kept in computer files in just a few locations. Measures of transmission facility performance/status are fed to a few locations. The personnel at those locations are the only ones in the system that fully understand the long-lines network. Loss of those locations could prevent reconstituting circuits (the data base would not be available), and restoration and control of transmission facilities (knowledgeable personnel and required equipment would not be available) for extended periods of time.

Concentration of communications facilities harms the national interest during times of national or regional emergencies. The loss of a single concentrated facility or a break in a high-capacity transmission link could destroy an unreasonably large part of the national communication capability. An even greater concern is the location of these facilities. They typically lie in areas that are likely to be targets during a nuclear war or in the event of major civil strife within the United States. The possible destruction of a significant number of these concentrated facilities within a relatively short time cannot be ignored. Almost total loss of long-distance communication would result from such damage.

Figure VI-1 illustrates areas designated as high-risk by the Defense Civil Preparedness Agency (DCPA) in 1975. DCPA developed lists of potential targets and assigned target values using unclassified sources. Military installations, military-supporting industrial, transportation, and logistics facilities, basic industries, and population concentrations were presumed to be potential targets.* Weapon assignments were based on separate projections of Soviet capabilities (circa 1980) and target values with the objective of maximizing targets destroyed and minimizing weapons expended. The black areas on the map depict sites subject to a 50 percent or greater probability of receiving blast overpressures exceeding 2 psi. Much larger areas, not shown on this map, were also designated as areas at high risk from fallout.

Thus, assumptions about an enemy's intent and capabilities affect the designation of high-risk areas. These assumptions change with time (and with the concerns of the responsible agency). The Defense Communications Engineering Center prepares an annual classified estimate of high-risk areas to guide the selection of sites for new communications facilities.

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* DCPA functions were transfered to FEMA; see chapter III.

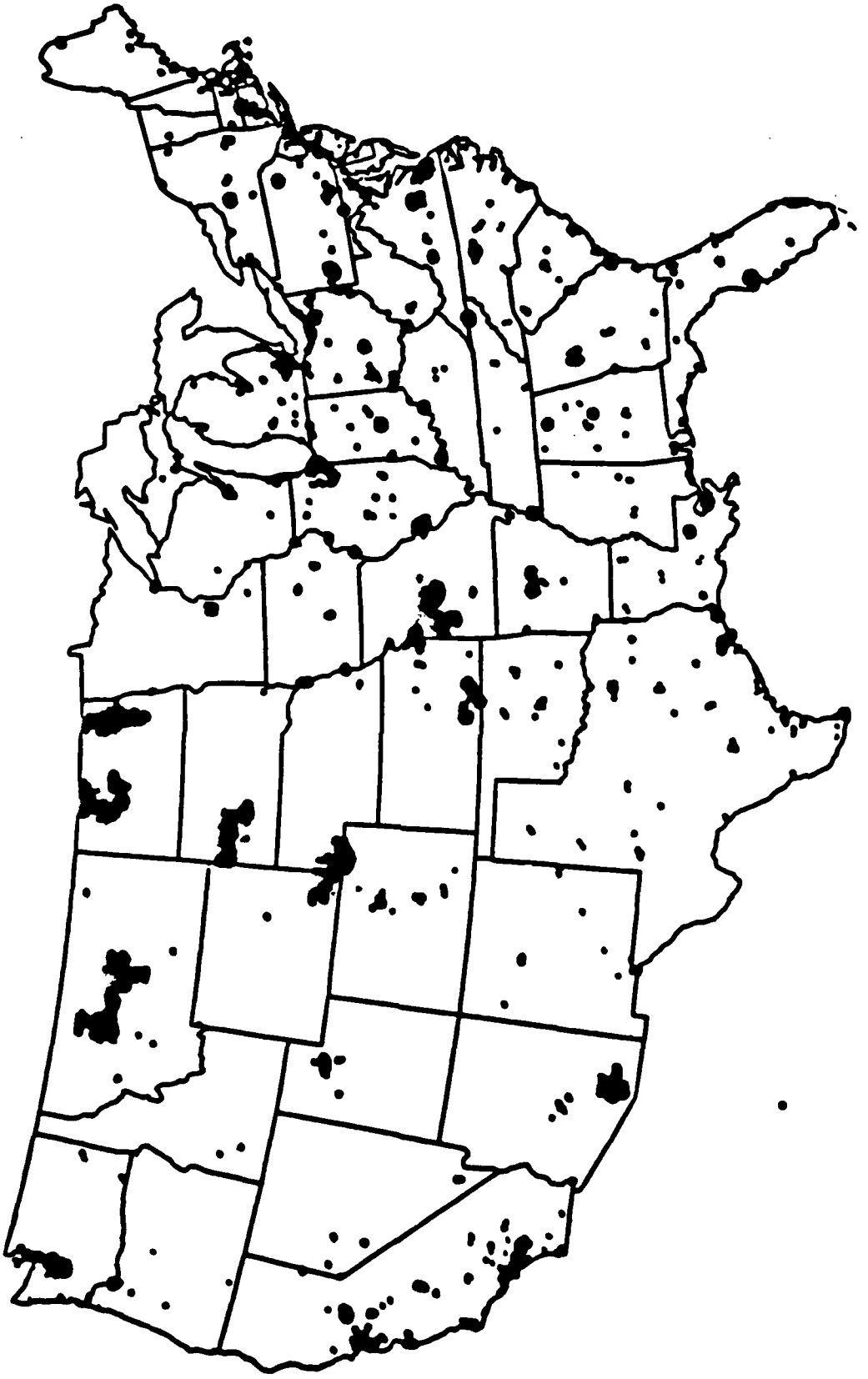

Figure VI-1 HIGH-RISK AREAS DEFINED BY CDPA

Below is a list of different types of facilitities and the percentage of AT&T facilities located in high-risk areas.

AT&T Facilities	Percent Located In High Risk Areas
Class 1 and 2 offices	80%+
Class 3 offices	60%+
Class 4 and 5 offices	<50%
Satellite terminals	100%
Network terminals	100%
Traffic service positions	90%+
Signal Transfer Points (CCIS)	90%
No. 4 ESS switches	95%

Electromagnetic pulse (EMP) effects on the national telecommunication system are another continuing concern. Extensive tests on switching centers and transmission facilities have shown that the equipment in place in the early 1970s was reasonably hard to EMP. Momentary upsets usually occurred and some components burned out when threat-level EMP was applied to a facility. However, since the burned-out components could usually be replaced in a short time and the facility restored to normal operations, no EMP protective measures have been applied to existing facilities nor have they been considered in the design of new equipment and facilities. Unmanned facilities are of particular concern; for example, an estimated 10 percent of all microwave relay facilities could be damaged by EMP. Will spare parts for repair be available, and how long will it take to reach remote sites, particularly under fallout conditions?

As LSI and VLSI components become more widely used, the previous evaluations of relative hardness of telephone systems no longer apply. New systems employing LSI and VLSI technology are thought to be more susceptible to damage from EMP. Further, large numbers of components in a switching center will more likely be damaged by EMP. Therefore, the capability to restore these new systems will be seriously degraded.

Only a few limited studies exist on the vulnerability of the commercial power grids in the United states, but this appears to be yet another area for special concern. The control of power grids has some of

the same characteristics as that for the telephone system: centralization of functions, concentration of personnel and facilities, and dependence on computers that can be damaged or upset by EMP. A major loss of commercial power for an extended period of time across the United States could occur in the event of major damage to facilities in a number of metropolitan areas from direct attack or damage resulting from EMP.

The national telecommunications system is protected against loss of commercial power only for a limited time. All important facilities have battery backup to furnish power for a few hours to a few tens of hours. All Class 1 to Class 4 central offices and some (perhaps 20 percent to 30 percent) of the Class 5 offices have additional motor-generator backup power that, with refueling, could provide power over a long time. In the transmission plant, however, while most microwave relays have a second backup power source (thermionic or motor-generator), on-site fuel storage is typically limited to a few days operation. The logistic problem of refueling all those relay facilities to provide enduring long-distance communications capability has not been planned for nor even seriously addressed.

Most important regarding crisis network management and control is the concentration of AT&T personnel and facilities. There is one primary network management center with three alternates. All four may be vulnerable to a massive nuclear attack directed against our communication assets. There are only six regional facility management centers capable of restoring all wideband transmission facilities within AT&T long lines. (A seventh in New York City is primarily responsible for network television). The AT&T system therefore appears to be vulnerable to large-scale nuclear attacks, direct terrorist attack, and to widespread natural disasters.

Plans have been prepared and personnel designated to coordinate emergency communication needs, establish priorities, and to direct employment of Federal communication assets. The capability that actually exists for effective management of Federal assets, though, is questionable. Other than the establishment of priorities for restoration, no adequate Federal plan has been established for direction and control of civil

communication systems in a national emergency. Finally, the AT&T facilities for management and control of the long-distance telephone system are vulnerable to direct attack (as are all other common carrier systems). No plans exist for dispersed control in a national emergency.

Figure VI-2 summarizes the vulnerabilities and weaknesses of the national telecommunications system for a range of crises.

E. The Damocles Sword

Some communication planners for emergency systems seem to believe that "private lines are better" for satisfying critical communications. As long as those private lines are functional, that is certainly true. The user has instant access, guaranteed routing, and no danger of being preempted while the conversation is in progress. For the most critical applications, though, multiple private lines are required to ensure availability through redundancy.

The fallacy of this approach becomes apparent if one considers that significant portions of the common carrier system may be inoperative when the emergency communications are required. The private lines traverse the same routes and use the same facilities as the public telephone system. The thin thread of a private line may transit dozens of telephone facilities, any one of which, if damaged, cuts the thread. If each facility has a 90 percent chance of survival, the private line has only an 8 percent chance of surviving if it was routed through 24 facilities.* This is the Damocles Sword hanging over many of the most critical emergency private-line circuits.

An alternative philosophy is that "bigger is better" applied to a switched network with multiple interconnecting nodes and alternate routing capability to provide a high degree of communications survivability for a large network with

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* ... statistical independence of random events.

Communication Requirements	Problems in Mobilization Requirements	Present Problems and Vulnerabilities to Localized or Regional Disasters	Present Problems and Vulnerabilities to Nuclear Attack or Widespread Disaster	Problems and Vulnerabilities to Widespread Disasters Projected to 1990-2000 Following Present Technological and Political Trends
ACCESS: 1. Availability of appropriate terminal to match local line and central office 2. Local transmission to central office 3. Availability of central office facilities to permit access by user	**ACCESS:** 1. Inadequate local transmission facilities in some relocation areas to accommodate more subscribers 2. Precedence capability depends on operators 3. Potential limitations on number of subscribers to some central offices in relocation areas	ACCESS [illegible] and appropriate load shedding questionable [illegible] precedence capability depends on [illegible] access to an operator and capabilities of TSPS	**ACCESS:** 1. *Very few mobile access areas* 2. Selection of bandwidth requires prior arrangement 3. Lack of user control over load-shedding priority 4. Very limited precedence capability	**ACCESS:** 1. *Greater variety of terminal equipment requirements* 2. Improved mobile access, but primarily in urban areas 3. Fewer restrictions on selection of bandwidth 4. No control over load-shedding 5. No precedence capability
ROUTING: 1. Address conversion 2. Signaling and supervision provided 3. Switching to available routes, or interfacing with dedicated private channel	**ROUTING:** [illegible] alternate routing [illegible] signal transfer points per [illegible] (SS) [illegible] capability	**ROUTING:** 1. Hierarchical switching centralized in high-risk areas, centralized control for special common carriers 2. Restricted alternate routing 3. Small number of signal transfer points (STP) used in common channel interoffice signaling (CCIS) 4. No precedence capability	**ROUTING:** 1. 1980 problems compounded, except possibly better alternate routing achieved in DDD 2. No consideration given to emergency use or to survivability 3. CCIS full implementation makes DDD system very vulnerable 4. Dedicated channels may become switched virtual links
TRANSMISSION: 1. Signal transport between designated end points 2. Signal reproduction (no loss, low distortion, minimum interference) 3. Alternate routes for restoration (for reliability)	**TRANSMISSION:** 1. Needed transmission network may be mismatched to translocated traffic demand	[illegible] dependent on a single [illegible] facility--too little	**TRANSMISSION:** 1. Dedicated channels concentrated in major routes and routed into high-risk areas for control 2. Insufficient routes avoid high-risk areas 3. Too few hardened routes (also, well known)	**TRANSMISSION:** 1. All 1980 problems will be worse 2. Reduced coordination and control 3. More independent and unique transmission facilities 4. Use of fiber optics will greatly increase concentration and will be installed in risk areas 5. No consideration given to survivability
END-TO-END INTEROPERABILITY: 1. All signal conversions occur in matched pairs or as needed to account for differences in systems		[illegible] ABILITY: [illegible] mobile radio interfaces with emergency agencies [illegible] to common [illegible] and routing	**END-TO-END INTEROPERABILITY** 1. Lack of interconnection between the *public telephone system*, leased networks within that system, other carriers, and private networks makes the question of interoperability moot at this time; major differences exist among these networks in addressing, switching, signaling, and terminals 2. Within common systems, terminal uniqueness causes some lack of interoperability	**END-TO-END INTEROPERABILITY:** 1. The 1980 problems will be exacerbated with the proliferation of independent carriers and the potential separation of AT&T, Bell Labs, and Western Electric
SUPPORT: 1. System management 2. Operating personnel on duty 3. Maintenance 4. Power at all facilities 5. Operating spares available	**SUPPORT:** 1. Too few installation personnel to handle large relocation of facilities	**SUPPORT** 1. Extensive [illegible] depends on [illegible] disaster area 2. Lack of [illegible] procedures [illegible] or realistic [illegible] 3. Questionable [illegible] federal [illegible] emergency [illegible]	**SUPPORT:** 1. Few regional facility control centers 2. Centralized monitoring facilities 3. Inability to utilize transmission facilities of other carriers (public or private) for restoration 4. Dependence on commercial power for endurance 5. Spares for reconstitution concentrated in risk areas	**SUPPORT:** 1. Less back-up power 2. No coordination between systems 3. Fewer spares for reconstitution 4. More automation, fewer operating personnel and only during limited hours 5. Less skilled maintenance for more sophisticated systems

Figure VI-2
SUMMARY OF VULNERABILITIES

each node connected to eight others and where each node has a 90 percent chance of surviving, the probability of being able to communicate between two surviving nodes is almost 100 percent.* Even if 50 percent of the nodes are destroyed, the probability of being able to communicate between two surviving nodes is about 85 percent.

The dial telephone system is the largest [illegible] the United States; it is available almost [illegible] significant degree of alternate routing [illegible], why is it not the preferred emergency [illegible]. For normal business and personal communication [illegible] system is without peer in the world for [illegible], and ease of use. For emergency communications, [illegible] weaknesses. Access to the central office switch can be [illegible] when many people are calling at the same time (as happens during a local disaster). There is typically no alternate routing available at the class 5 office level and all trunks can be busy due to heavy traffic demands. As a result of the heirarchial routing plan, the potential alternate routing capability of the system is not realized.

Because of these weaknesses, and the perception that these weaknesses will manifest themselves precisely when communications are needed, it is not likely that the dial telephone system will be selected as the primary medium for crucial emergency communications until those weaknesses are mitigated or resolved.

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* Assumes statistical independence of random events.

VII MAJOR ISSUES

A. The Principal Issue

In general terms, the principal issue is how to reap the benefits of new technologies without incurring undue costs while dismantling the old ones.[1] The issue involves the impacts of the introduction of new technologies on both the long-term stability and the short-term effectiveness of public and private institutions. The question, of course, is not limited to telecommunications -- the dilemma exists whether the technological advances are in energy, transportation, biology, medicine, or agriculture.

Here we are concerned about telecommunications. Telecommunications technology presents a premier example of technological innovation. Advances in information technology, the offspring of the marriage of computer and communications technologies, often proceed at a rate that bewilders even the technologists. Transmitting information by satellite or by fiber optic systems, switching and controlling networks with digital technologies, and the widespread use of terminals based on microprocessors have altered the nature and costs of telecommunications services and products. The growth in demand for services that transfer all kinds of information among various providers and users continues to be robust, despite considerable new capacity to handle increased demand added by both the established carriers and new entrants in the industry.

Dramatic technological advances and the increasing demand for diverse information transfer services are bringing about significant changes in the structure of the telecommunications industry. What were once two simple monopolies in the telephone and telegraph fields, respectively, are being replaced with a much more complex structure as new equipment manufacturers and new service providers join the established carriers in satisfying the varied demands of new and growing markets.

The problems accompanying institutional change among private and public telecommunications organizations are formidable. While technological innovations produce powerful incentives for change, there are also strong forces that resist change. First, the telecommunications industry is dominated by the largest and one of the most successful corporations in the world, the vertically-integrated Bell System. Secondly, the Bell System is regulated by an independent government agency, the Federal Communications Commission, established almost 50 years ago. These institutions, both singly and as an interactive pair, tend toward stability; changes do not occur easily.

But changes are occurring and the long-term impacts of those changes on today's institutions are not well understood. This study is concerned with how institutional changes affect the nation's ability to achieve vital NS/EP telecommunications objectives. While there has been considerable study and speculation on how these changes will affect the postal service, banking, business, home, privacy, consumer interest, and a host of other interests, the public record offers surprisingly little insight into the question of impacts on NS/EP telecommunications.* This is unfortunate, since, as discussed in the previous chapters, vital NS/EP telecommunications requirements dictate increased reliance on the services of the common carriers. We need to know how potential changes in the industry structure may affect those requirements.

For this study, then, the question is whether to pursue policies that while accommodating technological change, encourage or at least do not hamper telecommunications capabilities to meet vital NS/EP needs. Formulating such policies leads to three other issues. Each reflects a situation associated with one of three institutions -- the Executive

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* This void in the public record exists despite extensive congressional hearings on amendments to the Communications Act of 1934, various FCC proceedings addressing questions of competitive entry into communications markets, and a major study soon to be published by the Congressional Office of Technology Assessment (OTA) on the societal impacts of emerging telecommunications technologies.

Branch, the FCC, and the telecommunications industry — that requires resolution to establish an environment conducive to developing the desired NS/EP telecommunications capabilities described in the next chapter. The three issues and their institutional focuses are listed below:

Major Issue	Institution Focus
• Inadequate network management for NS/EP telecommunications among carriers	• Telecommunications Industry
• Regulatory uncertainty for NS/EP telecommunications	• Federal Communications Commission
• Fragmented organization for NS/EP Telecommunications	• Executive branch

B. Network Management

Public switched telephone service in the United States is supported by an integrated network of facilities totalling about 1 billion miles of wire, microwave, cable, and satellite transmission paths, about 27,000 switching centers, and approximately 175 million telephones. In addition to telephone service, this network also supports an expanding array of other services that require the connection of increasingly diverse terminals to the network. Further, there are a number of facility networks: some are owned by a single corporation while others are jointly owned; some networks remain separate, but many are interconnected. While most facilities are owned by the common carriers, business enterprises like railroads, pipeline companies, and utilities, own substantial networks. Federal, state, and local governments also own some network facilities.

The tradition of established common carriers owning all network facilities supporting public services is changing. Domestic satellite and other special common carriers, for example, own intercity transmission systems. Moreover, customer premises equipment no longer needs to be owned by the communications carriers. Furthermore, a provider of new telecommunications service need not own a facilities network. For example, value-added carriers can lease basic transmission and switching services from the common carriers to support their provision of enhanced network

services. The value-added carrier creates a new service network out of facilities owned by others.

Network management refers to the responsibilities of planning, implementing, operating, and maintaining both facilities and service networks. Adequate attention to network management on a continuing basis is absolutely essential to the proper functioning of these networks. While network management is a highly developed skill in a single integrated organization, like the Bell System* and the independent telephone companies, there are no comparable mechanisms to apply to the interconnected networks of separate carriers.** The responsibilities for network management are diffuse when a number of suppliers are involved in providing a facility or a service network. Joint planning is a critical aspect of network management and difficult to achieve among a number of different carriers.

While effective joint planning of national networks concerns policy makers, it becomes particularly important when such networks are or are intended to be used for NS/EP purposes. Vital NS/EP objectives require that parallel networks be interoperable so that in emergencies, like a nuclear attack, they can be used to establish alternate routes for essential communications. Achieving interoperability for such emergencies requires comprehensive joint planning and action before the emergency arises.

Although the FCC has encouraged multiple participation in the telephone planning process and has initiated some joint planning to resolve specific problems, no current joint planning process is adequate to address the unique issues stemming from NS/EP requirements.

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* About 35,000 Bell employees are engaged in all aspects of network management.

** Of course, some of the competitive carriers have developed highly sophisticated (non circuit-switched) network control algorithms that have enjoyed 4 or 5 generations of software development.

With some notable exceptions, like the FCC's actions in establishing rules regarding restoration of services in an emergency, regulators are apparently relying on different carriers to perform joint planning on their own when required. Such planning is likely to reflect economic and market conditions rather than vital NS/EP requirements. It is doubtful that market conditions alone will encourage the kind of joint planning that is needed; additional incentives appear to be necessary.

It is misleading to frame the joint planning issue as if its resolution required settling questions among a multiplicity of carriers who are equals. The Bell System dominates both in the telecommunications market share and in network management skills. Policies affecting joint planning must account for this and encourage the use of Bell's preeminent in-place network management skills for NS/EP telecommunications.

Finally, there is the matter of the Executive Branch's role in the joint planning process. Since the government sets NS/EP policy, objectives, and requirements it has a major stake in the outcome. To whom the government delegates planning responsibilities depends on answers to *questions such as the following:*

- Who has the responsibility to initiate these planning activities?
- Who can offer or set the standards needed?
- How does the use of new technology get encouraged?
- How are the methods of funding resolved?
- How are the various planning roles of the FCC, the Executive Branch, and the carriers to be resolved?

C. Regulatory Uncertainty for NS/EP Telecommunications

Changes in the telecommunications industry structure have been accompanied by an uncertain regulatory environment for NS/EP telecommunications. Over the last 30 years, the regulatory environment for telecommunications has changed dramatically. Most of the changes, however, have taken place in the last decade (see chapter IV). They can be expected to continue in the future as well.

Technological developments, the need for specialized services, and the potential of new telecommunications markets have encouraged the growth of competition in an industry largely made up of monopolies. Regulators had to develop policies that applied to a changing industry structure on the basis of a statute written when the telephone, telegraph and radio were the only telecommunications technologies available. In doing so, they favored regulatory goals like eliminating cross subsidies, pricing services on the basis of their costs, introducing new technologies, and encouraging innovative services. Their decisions were not always predictable, were often challenged in the courts, and were sometimes reversed.

Perhaps because of this preoccupation with a changing environment, the regulators have almost consistently neglected the impact of industry change on our NS/EP capability. They, of course, were not alone. The industry became less concerned and until the last few years the DoD expressed little concern even though they were substantially increasing their dependence on the common carriers.

The pursuit of these regulatory goals and the accompanying uncertainty and neglect began to charge long-standing relationships between the established common carriers and government agencies responsible for NS/EP telecommunications. Earlier, established carriers, often acting on their own, increased the survivability and restorability of their services and facilities to meet the NS/EP requirements. As competition develops, however, the established carriers may not continue measures to improve the survivability and restorability of their networks. Also, Federal regulations may not require the carriers to provide such measures. The

resulting uncertainty is increasing the difficulty of providing vital NS/EP telecommunications that depend substantially on common carrier services and facilities.

Amendments to the Communications Act of 1934 were considered in the 96th Congress. It is unlikely that the legislation would have resolved the regulatory uncertainty for NS/EP telecommunications, since specific NS/EP policy guidance would not have been given to the FCC. Additionally, current Federal antitrust action against the Bell System adds to the uncertainty of the future regulatory environment for the telecommunications industry.

Some of the problems facing the regulators are expressed in the following questions:

- How does the FCC anticipate and meet its NS/EP responsibilities?
- Who establishes the relative priority of NS/EP among other regulatory goals like increasing competition?
- Will the FCC require carriers to serve the special needs of NS/EP customers?
- What peacetime authority over the carriers is required for NS/EP purposes?

Regulatory uncertainty for NS/EP telecommunications will probably continue, but this situation can be improved by establishing parity for NS/EP with other telecommunications goals.

D. Executive Branch Organization for NS/EP Telecommunications

Executive Branch agencies responsible for telecommunications have likewise undergone significant change in the last 25 years (see Chapter III). Some changes have been evolutionary, like the creation of the Defense Communications Agency (DCA) in the Department of Defense to consolidate strategic military communications in one organization. Other changes, however, have not enjoyed as logical a development as DCA. This is especially true of telecommunications policy functions in the Executive Branch, particularly those for emergency preparedness.

Controversy and change characterize the Federal Government's organization for telecommunications policy. For the most part, the controversy stems from an on-going argument over whether such functions belong in the Executive Office of the President. Each new administration alters the organization established by the previous administration (see Chapter III).

The organization of NS/EP telecommunications is fragmented among several Executive Branch agenices. NCS was originally created to unify the capabilities of these agencies, but this goal has only been partially realized. Questions like the following can be raised:

- What are our primary NS/EP telecommunications objectives?
- What degree and kind of unification for NS/EP telecommunications are required?
- Should the authority be centralized or dispersed?

The fragmentation of NS/EP telecommunications policy functions in the Executive Branch presents a serious problem. Various agencies, both within and outside of the Executive Office of the President have been assigned responsibility to set or coordinate NS/EP telecommunications policy. The assignment of responsibilities is confusing and coordination is difficult.

There is a lack of adequate organizational mechanisms to coordinate telecommunications policy for military and civilian emergency preparedness. Finally, NS/EP policy considerations need to be [illegible] the development of a national telecommunications [illegible]

Reference

1. Letter to President Andrew Jackson from Martin Van Buren, Governor of New York, Jan. 31, 1829. The letter appears below:

To: President Andrew Jackson,

The canal system of this country is being threatened by the spread of a new form of transportation known as 'railroads'. The federal government must preserve the canals for the following reasons:

One. If canal boats are supplanted by 'railroads' serious unemployment will result. Captains, cooks, drivers, hostlers, repairmen and lock tenders will be left without means of livelihood, not to mention the numerous farmers now employed in growing hay for horses.

Two. Boat builders would suffer and tow-line, whip and harness makers would be left destitute.

Three. Canal boats are absolutely essential to the defence of the United States. In the event of the expected trouble with England, the Erie Canal would be the only means by which we could ever move the supplies so vital to waging modern war.

For the above-mentioned reasons the government should create an Interstate Commerce Commission to protect the American people from the evils of 'railroads' and to preserve the canals for posterity.

As you may well know, Mr. President, 'railroad' carriages are pulled at the enormous speed of 15 miles per hour by 'engines' which, in addition to endangering life and limb of passengers, roar and snort their way through the countryside, setting fire to crops, scaring the livestock and frightening women and children. The Almighty certainly never intended that people should travel at such breakneck speed.

Martin Van Buren
Governor of New York
January 31, 1829

VIII ATTRIBUTES OF AN NS/EP TELECOMMUNICATIONS CAPABILITY

A. Purpose

To a large extent all that has been presented so far has been prologue; background material and issues needed to understand the NS/EP telecommunications setting. Now the focus shifts to a new or at least improved NS/EP communications capability.

The fostering of a greater NS/EP telecommunications capability may require numerous and widely ranging changes in government policy. The changes may vary from legislation to initiatives that can be invoked readily within NCS. But rather than drawing up a set of perceived policy changes or initiatives based on a random collection of concerns, SRI has tried to develop a more orderly process. In particular, the policy options or initiatives suggested in this study are associated as explicitly as possible with not only the basic NS/EP telecommunications objectives and the corresponding capability to be created, but also the atmosphere or environment for change as well. They are closely tied to the basic attributes the desired system should have. Thus, the options are designed to be comprehensive and defensible without over-reaching into areas not vital to the establishment of the NS/EP telecommunications capability.

B. The Functional Need for a NS/EP Telecommunications Capability

The need for a more trustworthy communications system in times of crisis stems most directly from the objectives discussed in Chapter III. Those objectives can be expressed in terms of the four major areas shown in Figure VIII-1: the nature of the command and leadership functions, the spectrum of entities requiring communications, the spectrum and pace of emergencies to be dealt with, and the various political, technical, and fiscal environments within which the system must be created and function. From these few categories a National Survivable Telecommunications System (NSTS) can be defined in broad terms to meet the stated objectives.

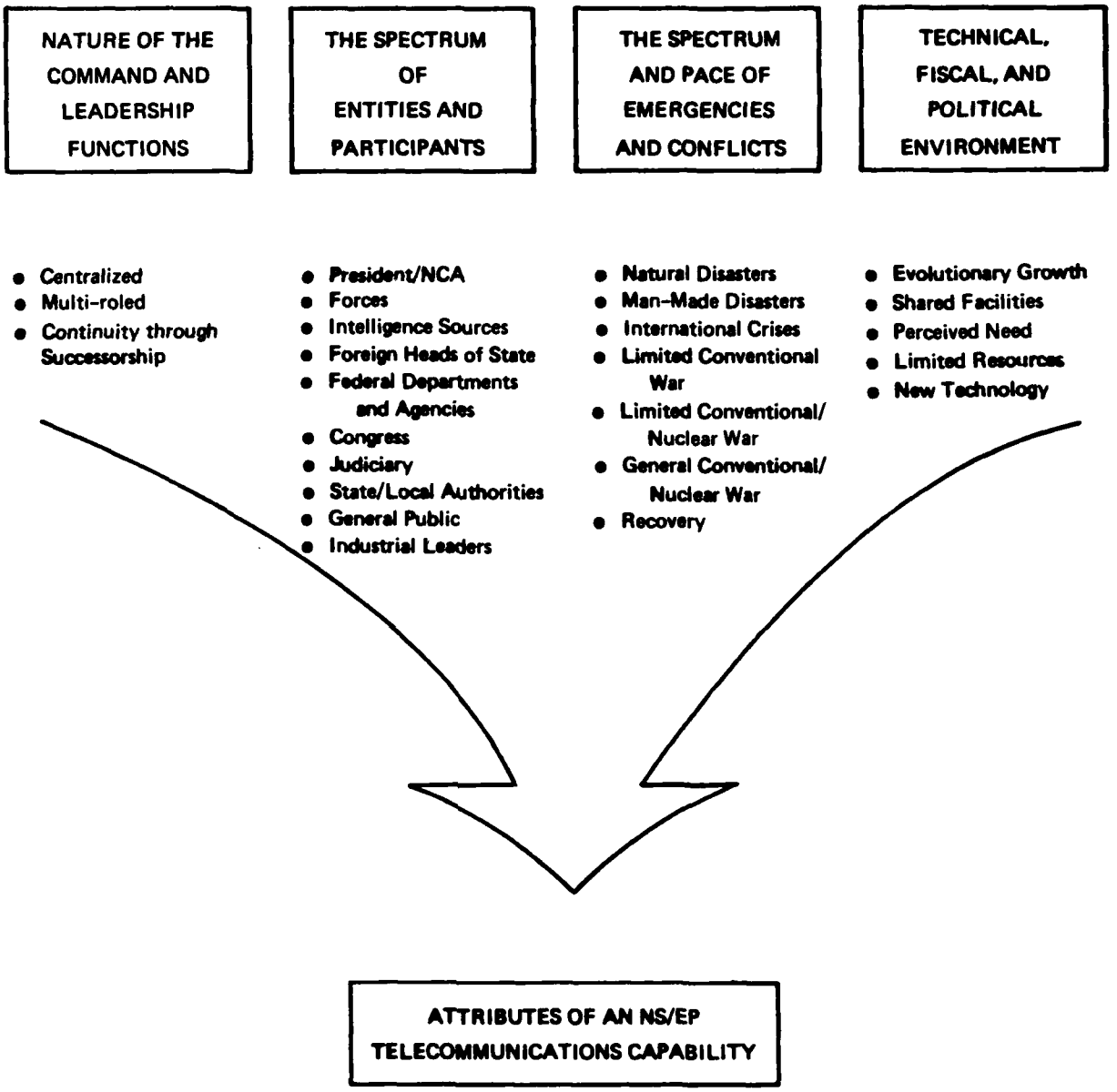


Figure VIII-1 GENERATION OF NS/EP TELECOMMUNICATIONS ATTRIBUTES

Government leadership roles have several common traits that are important to the communications that support those roles. First, leadership and decision making, at least within the Executive Branch, are centralized in an individual and the associated facilities. Thus, prominent leadership positions can be easily located, as can their connections to the principal communications facilities serving their offices.

Second, Americans believe in a defined, orderly succession of leadership. This succession has been elaborately set forth in the Constitution, in statute, and in presidential directive. Under the gravest national emergencies both the public and government officials at all levels need to know who the appropriate leader is and how that person can best be supported. The President has many roles (See Figure III-2) in a crisis and needs numerous communications channels. This arrangement is mirrored at the state level. To maintain an authority or, failing that, to permit the succession process to occur, now requires broadly distributed communications. Furthermore, the pace of conflict is such that appreciable delays are intolerable. To meet the challenge that modern conflict places on leadership requires almost continuously available communications.

The leadership functions involve a broad spectrum of participants in all levels of government. They include most of the duly elected officials, public safety organizations, and the military, plus many in the private sector. The latter includes the major stockpilers and producers of critical raw and war materials. Preattack mobilization, while not requiring communications survivability, may require the government to preempt substantial portions of our national telecommunications networks. Since government and private contributors to mobilization are spread across the nation, the PTS becomes the most practical communications network to use.

Further, the notion of a prolonged war places new and extraordinary demands on telecommunications. To be comprehensive, communications must be capable of serving through emergencies ranging from natural disasters, to mobilization, to the entire scale of military conflict. Now it must also serve to control a strategic nuclear force plus recovery from war as well. Figure VIII-1 lists the scale of crises.

Finally, an adequate NS/EP capability must be developed within a setting of political reality, limited funds, and new technology. This study focuses on what is required to create the proper setting.

C. The Derivation of Attributes

To survive repeated nuclear attacks or lesser crises, an NSTS, to be ideal, should have the following set of attributes. These are intended to be reasonably exhaustive so that the policy options derived from them will be sufficient. The attributes fall into technical and non-technical groups. Each can be related to the specific items in Figure VIII-1 (and thus to the NS/EP objectives), to the policy issues discussed in Chapter VII, or simply to the process of establishing a successful, responsive capability.

The technical attributes in more or less descending priority are:

High Network Availability -- Essentially a time and capacity measure referenced to user access; that is, the likelihood that any given user can gain access to and successfully use the system at a given moment. It includes survivability and restorability in an emergency or war, reliability of individual elements, physical redundancy, particularly in avoiding potentially targeted areas, and a system design responsive to changes in network connectivity.

Broad and Controllable Network Access -- Addresses the need for a broad spatial distribution of access points. Defines the ability to control access and then establish a priority call that is maintained across the network. Voice and data, including mobile radio access, are implied.

Responsive Network Control -- Dynamic allocations of network resources in accordance with prioritized demand. This includes monitoring the state of the network facilities, the status of the overlaying system, the interfaces with other networks, and perhaps to a few important users. It should be distributed as widely as possible to help provide adaption under a wide range of emergencies.

Extensive Interoperability Among Member Networks -- Principally addresses connections between networks that are as transparent as possible at the user-to-user level. Also important for redundancy through alternate-route networks.

Of critical importance is the promulgation of NSTS standards for interconnection.

Flexible Degree of Dedication -- Intended to match the degree of preemption of shared resources as defined by the severity of the emergency or conflict. This assumes that some sharing of resources is likely and that preemption may apply to both public and private systems. Forsees the time when stored-program controlled facilities can be manipulated by authorized agents to gain needed capability.

Wide Range of User Services -- User-oriented services with the potential for encryption and reflecting the variety of media such as voice, facsimile, graphics, conferencing, broadcast, and data. Sets technical interface and performance criteria. May include supplementary services like directories and data base management on network hosts.

The non-technical attributes are derived in part from the major policy issues discussed in Chapter VII, from the need to establish a permanent, funded, and responsible agent, and to do this within competing national priorities. They are:

Appropriate Legislative Basis -- The most durable expression of a need for a survivable national telecommunications system. Sees the establishment and operation of a survivable system as in the public interest. Assigns the executive function to a regulatory or Executive Branch agency.

Centralized NS/EP Telecommunications Policy -- An expression of the need for a single, consistent, high level source of policy and guidance in NS/EP telecommunications matters. The lack of centralization led to the present organizational fragmentation among several agencies.

Authoritative Executive Direction -- The certain requirement for a single, powerful, executive agency with budgetary power and supervisorial authority over the operating agent. Also responsible for network facilities and overall system planning and management.

Comprehensive Network Planning and Management -- Critical to achieving an integrated and useful system, one that is evolutionary in both technology and service to users. Important that planning be broad enough to anticipate change in threats and in user requirements. This is logically the function of the executive agent with the direct support of the operating agent.

Competent Network Operation -- Necessary to ensure that the system performs reliably and meets design goals. Must define an agent who operates and maintains the system in peacetime, but who is trained for and practices for emergency situations. This would likely be a common carrier.

Supportive Regulatory Environment -- May be derived from a new legislative basis, but also could be a new NS/EP emphasis on regulations under present legislation. Includes a dedicated enforcement of regulations that defines NS/EP roles of the common carriers and assures compliance.

Reasonable Cost and Schedule -- Stipulations that permit the establishment and operation of an NS/EP telecommunications capability within the constraints imposed by other national priorities. Imperative to obtain multiyear commitments in both design and operational phase.

Feasible Financing Method -- Basically a suggestion that DoD only funding may be inappropriate and even inadequate. To be affordable, a survivable national telecommunications system may have to be funded, and thus grow, incrementally.

These basic attributes are summarized in Table VIII-1.

TABLE VIII-1

Summary of the Attributes of an Ideal NS/EP Capability

Technical

- High network availability
- Broad and controllable network access
- Responsive network control
- Extensive interoperability among member networks
- Flexible degree of dedication
- Wide range of user services

Non-Technical

- Appropriate legislative basis
- Centralized NS/EP telecommunications policy
- Authoritative executive direction
- Comprehensive network planning and management
- Competent network operation
- Supportive regulatory environment
- Reasonable cost and schedule
- Feasible financing method

D. The Range of Ownership and Operating Agent Alternatives

The attributes just presented allude briefly to the important questions of ownership and operation. The required ubiquity of service, particularly under the more recent survivability imperatives of proliferation and redundancy, leads one inalterably to the network of established common carriers (ECCs). Supplementing that network by newer carrier or private networks, in the spirit of PD-53, may also be necessary; but the fact remains that government and military dependence on the PTS has grown so large that one cannot easily dismiss the inevitability of an NSTS, the major portion of which is owned and operated by common carriers.

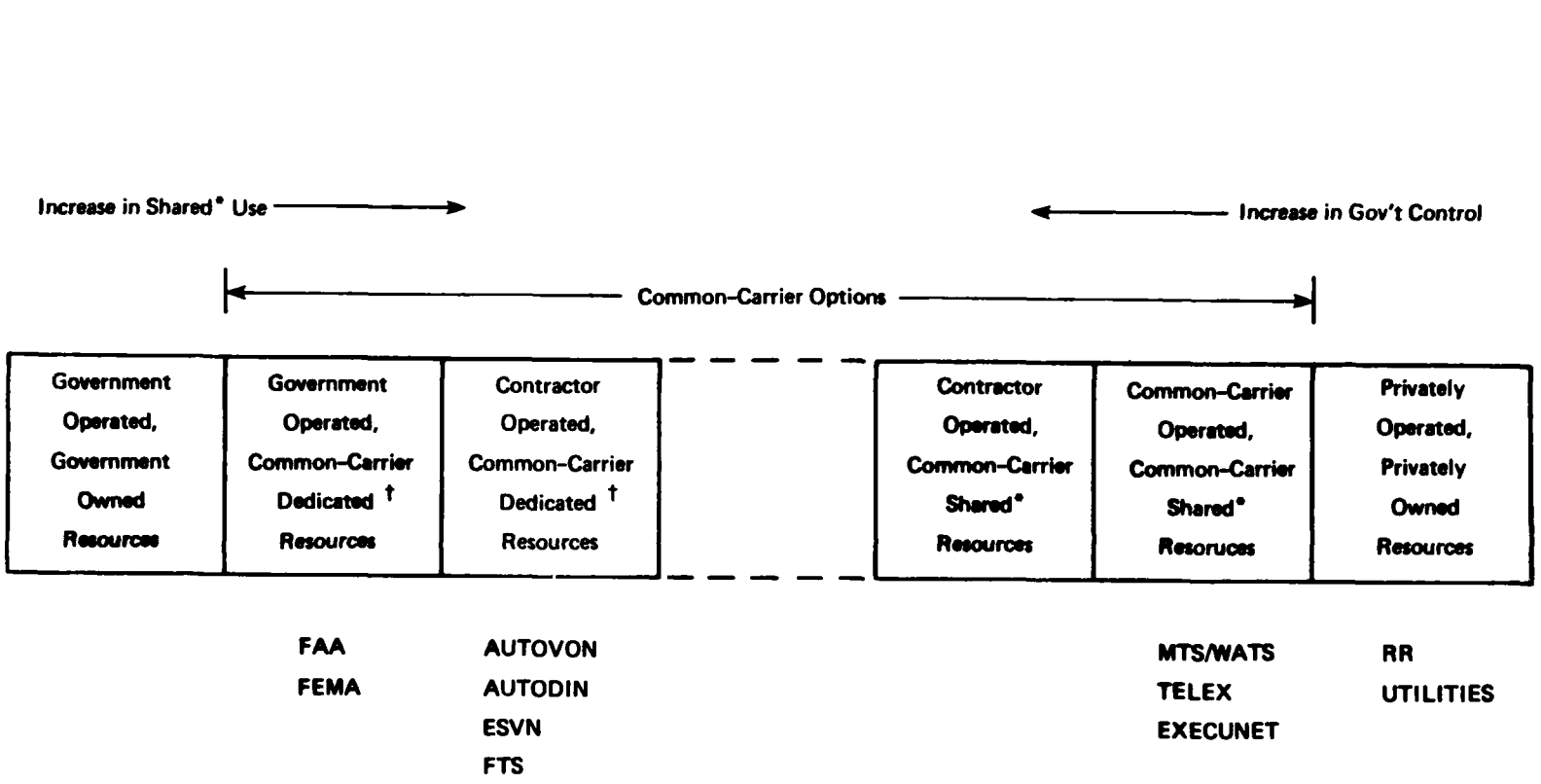
Still it is useful to examine a range of possible ownership and operating options as shown in Figure VIII-2. The outer boxes can be excluded because an NS/EP service would be impractical if totally outside the common carrier world. (It would also be outside our scope of study.) Shown are a range of options and some examples of existing networks or services in each category. Identifying where in this range an NSTS should reside is probably not necessary for this study. It is perhaps sufficient to simply assert that the common carriers and their facilities will unquestionably be involved.

E. A System Concept for an NS/EP Telecommunications Capability -- The NSTS

1. System Characteristics that Address the Functional Need

Many important requirements for a national survivable system have emerged. Any system intended to maintain a residual capability through and beyond a nuclear attack for a diversity of users must have the technical attributes plus the organizational and fiscal underpinning outlined in Table VIII-1.

With the relentless buildup of the Soviet nuclear arsenal comes a realization that fixed-point defense of a relatively few critical communications nodes is out of the question. Such concepts may have been



* Means shared by Government and General Public.

† Dedicated means no public access or sharing of at least the switching facilities.

Figure VIII-2 A RANGE OF OPERATING AND OWNERSHIP ALTERNATIVES FOR REALIZING AN NS/EP TELECOMMUNICATIONS CAPABILITY

acceptable under a doctrine of all-out retaliation, but a measured and prolonged response requires a significantly different approach to communications. To ensure endurability, the new hallmarks of communications system design are proliferation, redundancy, ubiquity, mobile accessibility, and restoration.

The network itself must become untargetable. The network must be so widespread, so highly interconnected, so survivable, that the cost to an enemy to obliterate its connectivity becomes unacceptable. In short, an enemy must be left in considerable doubt as to whether our communications systems can be denied to those responsible for conducting the war.

Creating a system with the above attributes could be very expensive, prohibitively so if each mission-oriented arm of our national defense attempted to build its own network. Fortunately, a large number of government, common-carrier, and private systems already span the continent. These systems have their own operating and maintenance organizations and, with supplementation, could provide many of the necessary attributes mentioned above. (Some of the present shortfalls were mentioned in Chapter VI and will be noted later.) Also, many mission-oriented agencies already have their own communications networks that will likely be retained but which require improvement. In addition, nearly all such networks, including those for emergencies, already rely extensively on the present telephone system.

Thus, some portion of the PTS, supplemented in ways to be discussed later, is a practical candidate upon which to base a national survivable communications system. Creation of a totally new, dedicated system would not only be very costly but, being smaller, could be more easily targeted. It would not blend as inconspicuously into the overall national system, nor could it expand and contract in its shared use of public carrier facilities.

2. The Users of The System

Users of the NSTS range from the President to the Armed Forces to local officials. (See Figure VIII-1.) Again, only the PTS or some portion of it, supplemented by radio systems, could begin to accommodate such a diverse set of users over such a geographical expanse. To the President, it must provide reliable linkage to his four-part world (see Figure III-2), with paths to the military and foreign heads of state. In this role it must be survivable as possible. To Presidential successors it must provide a survivable means to help resolve and perhaps even implement successorship. To the local and state official, it must provide reliable connectivity in times of lesser emergencies and at later times in a major war. Here restorability is more important than survivability. To a critical set of military users, it also may provide a means to increase the survivability of some portions of their own dedicated networks.

Important to many applications is some degree of mobility; that is, the capability to move quickly to various, perhaps prepared points to gain access to the surviving network. *It does not* necessarily mean, however, continuous connection while in motion. The term mobile accessibility is used for such connections.

One might reasonably suggest that the diversity of need throughout the entire government, including the military, is too great to accommodate all users within a single network. To protect and conduct the presidency, however, requires an ability to function over broad areas within CONUS, therefore an equally broad, distributed communications topology is needed. Stretching this presidential network to include such a topology, realizing that the communications interfaces to the forces he commands must also be widely distributed (so as to be unlikely targets), and recognizing his need to talk to and gain information from state authorities, means that the resulting topology becomes useful for a great many state and local needs as well, should sufficient capacity exist. Thus, the spectrum of users and uses require a broadly distributed network, capable of surviving and granting privileged access to those most needing it.

3. A Concept for A National Survivable Telecommunications System (NSTS)

At this point it is necessary to define more precisely the concept of a national survivable telecommunications system (NSTS). Since the study's major purpose is to illuminate certain policy options required to foster an NS/EP capability, this concept cannot be termed an architecture. Enough detail has to be given, however, to help uncover issues and to obtain some order-of-magnitude costs for such a system (see Appendix B). To emphasize that there is still a lot of flexibility under the concept to be presented, a brief technical alternative will also be mentioned. Finally, no serious attempt at an architecture that involves the common carriers can be undertaken without their involvement and consultation.

Outlining the structure of a survivable system begins, then, with some portion of the present core system, principally to gain ubiquity and an existing, in-place, self-consistent resource with a concomitant operating organization. What fraction of the PTS might be required is a complex question of need and cost, but it will be a significant fraction.

But this portion of the core network is only a point of departure since it does not satisfy, as pointed out in Chapter VI, all of the attributes stated earlier. It is not adequately survivable and therefore might not always be available when needed. Further, its broad accessibility is not controllable, it may not have adequately responsive network control nor restorability, and it cannot be simply adapted to the government's needs (preemption) as defined by the severity of the crisis. Thus, the telephone system must be supplemented. Table VIII-2 below addresses the various enhancements that would be needed.

TABLE VIII-2

Survivability and Priority Enhancements

Increased Survivability through Link or Node Augmentation

- EMP protection
- Supplemental non-hierarchical trunks
- Better auxiliary power and fuel resources
- Target-avoidance siting
- Radio supplementation for failed links
- Improved land-mobile radio access points
- CCIS backup
- Risk-avoidance-routed private lines

Increased Survivability through Network Augmentation

- Automatic interconnection to selected OCCs and private networks
- Supplementation through USNET [1]
- Interconnection to survivable military networks
- Interconnection to military common-user networks
- Supplementation via DDD interconnection
- Dispersed capability for survivable network management/control

Priority Use of Network

- Access control
- Route precedence establishment
- Preemption capability

Since the NSTS is to be considered part of the public network, perhaps sharing some of its facilities, what then distinguishes it from the other parts? Physically, it is different in terms of being more protected and offering greater capability. To describe its use consider the following. A critical government subscriber first dials a special code to access the NSTS then dials the regular number. Automatically the access office recognizes the number and invokes a special routing code that causes the call set-up to procede only through the prepared NSTS network. If the destination number dialed cannot be reached entirely within the NSTS the caller is notified and the route may be optionally completed through the general PTS. While all critical government traffic would pass through the NSTS part of the network, some public traffic would also pass through it

when capacity is available. The critical user would pay a premimum rate whereas the casual user a normal rate, since he is capable of being preempted.

The major elements of this conceptual system could, for example, include: all Class 4 and higher switches and a large number of Class 5 offices, existing and supplementary trunking facilities, some type of distributed but elementary network management system automatically invoked as large numbers of network elements begin to fail, some highly survivable order wire that would double as a low capacity channel for the most critical traffic, network interfaces, and a minimum of terminal equipment (terminal equipment is assumed to be provided by the relevant user).

The Class 5 or end offices considered as part of the NSTS will be some fraction of the present set. There should be enough of them to provide flexible access to authorized users and to discourage targeting them. The problems at these switches are principally their availability for use and their guaranteed accessibility to authorized users. This means EMP and perhaps fallout protection, plus some means to preempt the public's use of the switch. Controlled access will include an ability to obtain a dial-tone (perhaps through special subscriber lines), then a screening for authorized access, and finally an ability to establish a precedence route through the network. Several hundred to as many as 1,000 switches may have to be prepared to create an adequate network.

While not firm at this point, it seems useful to include all existing or planned toll switches and all higher level switches as well. While the latter are often located within target areas (see text associated with Figure VI-2), modifying them to survive EMP may not be prohibitively expensive since there are not many of them. Toll switches, particularly when supplemented by non-hierarchical trunks to other Class 4 and to Class 5 offices, may form islands of coherent networks when the overall core system is being fragmented. These switches will have to be modified to help establish precedence circuits. They must also be protected from the physical effects of a nuclear blast.

Trunking facilities are largely the sole or shared property of the operating companies. While the terminals of many of these facilities may be destroyed by collateral damage to large cities, most towers or cable repeaters will be intact if they have been protected from EMP. Means must be sought to create portable microwave or other radio facilities to help restore this aspect of the system. In doubt is whether the faults in the system can be easily and quickly located so that teams can be dispatched to fix them. (Radio-active fall-out could hamper such repairs).

The ability to preempt both switching and transmission facilities may be needed. How this can be done outside of stored-program controlled switches is not known and may influence what facilities are capable of being used or what replacement priorities exist.

Since highly centralized control is vulnerable to attack, more widely distributed network management is needed. To be ultra-reliable and economical to distribute, network control must be simple and perhaps dormant in specified switches until needed or used in exercises. At that time, it must automatically sense the status and extent of its environment perhaps with the aid of a survivable order wire, and either act on that information or reveal it to specially trained restoration teams to act on. A network management methodology should include restoration plans for both local and "long lines" facilities. This planning must include both qualified people and various equipment designed for diagnosis, restoration, and control (see Chapter IX).

The notion of a survivable, low capacity channel for use as an order wire or an emergency command channel has considerable merit. Concepts like USNET[2] rely on the low-bandwidth interconnection of many, widely distributed networks that have different (independent) vulnerabilities. Microprocessor-based gateways between various networks become intelligent switches in a higher-order network, where individual links are in fact transport networks. To cope with the myriad of interface problems and the potential for a large number of random "links," such a network may have to rely on store-and-forward digital technology.

To be useful to many users who will remain on existing networks and to gain additional robustness under stress and conditions, the NSTS will have interfaces to several other types of networks, as noted in Figure VIII-3. The OCCs, the regular DDD*, and the private line networks provide redundancy and backup connections should the NSTS become fragmented. All except the private networks are also there to provide access to legitimate users of those networks.

Connections with other networks are obviously critical. They are more than just electrical connections following some published standards (and here the choice of a system based on existing common carrier facilities results in the most straightforward technical standards), but they must be designed to provide system-level interoperability. In other words, the user on one network must find the interfaces through the NSTS as transparent as possible.

This may not be possible in all instances. For example, an interface to AUTOVON may require a tandem dialing sequence. Users that will want to connect with NSTS are: both fixed and mobile military and intelligence nets, continuity of government nets, State Department nets, White House Communications Agency, public broadcasting network, and some highly survivable order-wire such as USNET.

Thus the NSTS, presented here as an example, is a specially augmented subset of the PTS that serves as a backbone for delivery of critical traffic among member networks. If such a concept proves feasible, it may become a replacement for many of the present mission-oriented or government common-user networks. That is an appropriate subject for consideration. Finally some additional thoughts on the concept are listed in Table VIII-3.

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* It is not clear at this time whether the NSTS retains all the operating capability of the DDD network. If so, this interface is moot.

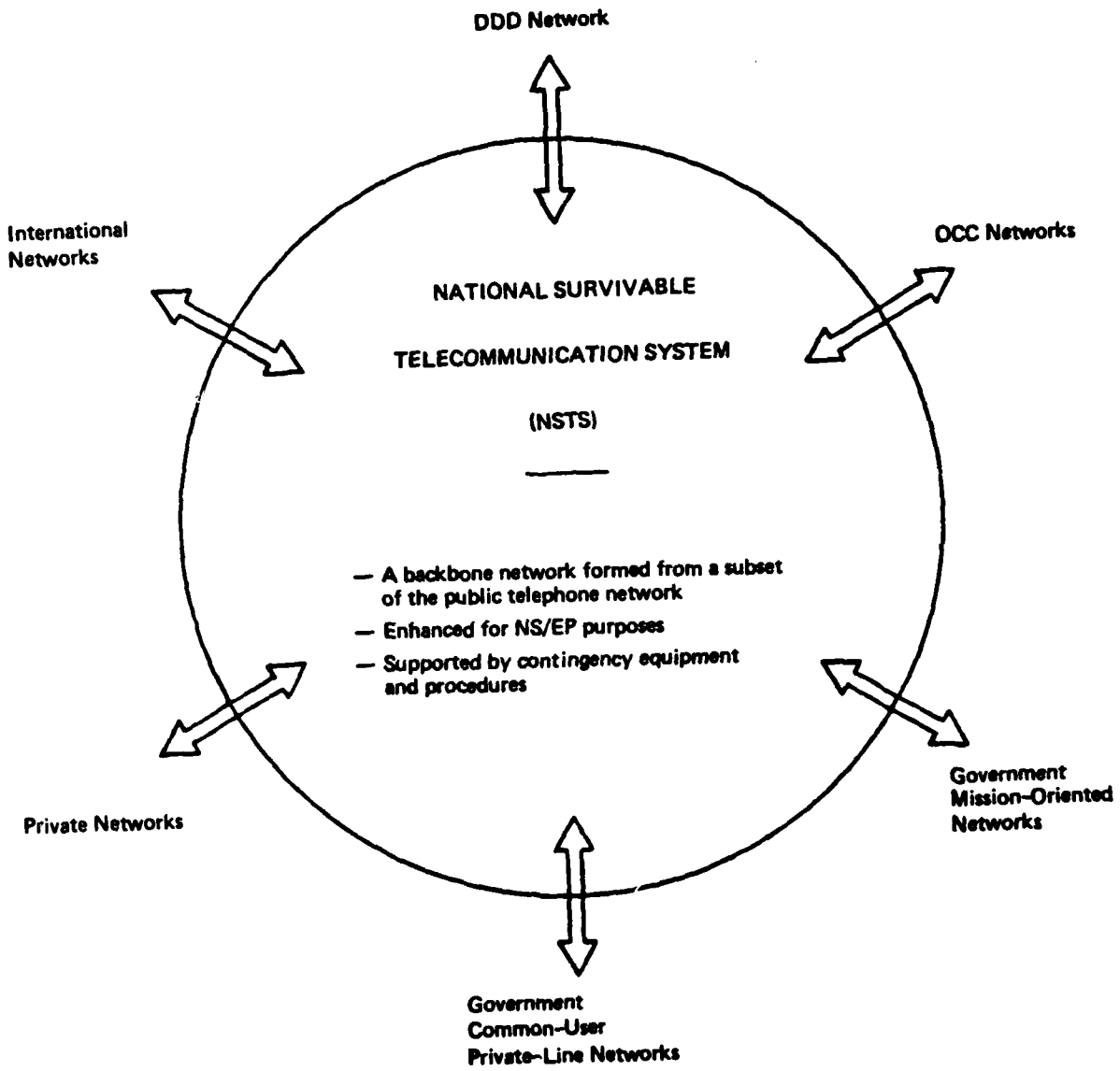

Figure VIII-3 NS/EP TELECOMMUNICATIONS SYSTEM CONCEPT

TABLE VIII-3

SOME VIEWPOINTS ON THE NSTS CONCEPT

- Adequate implementation of the national security telecommunication objectives requires an aggregation of separate networks.
- It is probably infeasible to alter all member networks to give them all NS/EP attributes.
- The executive agent must create and promulgate:
  - A well-defined mission for the aggregate system and the more specific NSTS backbone (which has a considerable number of NS/EP attributes.)
  - Technical and operational standards that provide system level interoperability.
- Participation in the aggregate system requires member network compliance with those standards.
- Member networks have varying degrees of freedom in their compliance. Armed forces have none, private systems, considerable.
- Costs associated with the incorporation of a member network are in proportion to its contribution to the mission.
- Discontinuities in capability between member networks cannot threaten the general mission.
- The NSTS must be provided with contingency equipment and procedures along with skilled personnel to enable reestablishment of connectivity and control.

4. The Operating Organization

No system of the scale of the NSTS can function well without an operating agent to guide its development and to create and enforce standards and measures of performance. Furthermore, that agent should be a single entity reporting to the system's executive agent, who sets the major goals and architecture and interfaces to the user community. One advantage of selecting some portion of the core system as a basis for the NSTS is that there are existing interconnection standards at all levels of the signal heirarchy and there is a competent existing cadre of operation and maintenance personnel.

5. Alternative System Concept

A case has been made for taking advantage of the enormous investment, the topological extent, and the working condition of the core system. Should there be other variants on how a portion of that system gets transformed into the NSTS, they are beyond the scope of this study. That is properly the subject of another task. It is useful, however, to mention that there are other approaches (e.g., a more dedicated system, but shared among government users).

Instead of creating a government-oriented network within the core system, a more independent system of switches and trunking facilities could be created that would normally co-locate with core system elements but sometimes locate elsewhere, perhaps on government land. The switches could be somewhat separable, or even independent of the core system as the need arose, and the trunks could be separate or shared. A large number of such nodes, perhaps a thousand, would be scattered around CONUS for the same reasons as discussed earlier.

Being small, modern, digital PBX-like switches, they could be programmed to establish network circuits (including precedence routing), to distribute network control using packet switching, to connect to existing core system facilities and to special supplementary radio, other common carrier links, or USNET type of equipment, and to handle access control. Those facilities at core system sites could be maintained by the

appropriate established common carriers and those at separate locations could be contractor operated and maintained. Being smaller and perhaps using low-power dissipation technology, these switches could be maintained on standby power for much longer periods than, for example, a central or toll office. The switches themselves could also be made more capable of surviving.

On the debit side, such an alternative would be an almost entirely new network that shadows much of the existing core system. Sites used by the new elements would be more visible and with some connections to the existing system might share some of the latter's vulnerabilities unless these problems are specifically addressed. If parts of the core system are upgraded in making them survivable to prevent that, then an advantage to the alternative system is lost. The more dedicated system must be tailored to the expected demand across its topology. It would lose the potential for the flexible sharing made possible by using larger-scale resources. Since the auxiliary equipment would be unique, special training and parts would be necessary. If the new system had its own local distribution and subscriber equipment, it would be very expensive. If it uses the present plant, a different arrangement would probably be required.

Thus, there are other approaches to achieve a survivable national telecommunications system. Its architecture will, therefore, require continuing study.

F. Present Deficiencies and Candidate Policy Options for Remedies

The attributes of an ideal system (Table VIII-1), together with the system concept just defined, illuminate how the present common carrier networks have trouble meeting NS/EP requirements. Because we begin with the previously defined attributes, the deficiencies and corresponding corrective or remedial measures will be considered in that order. This process of explicit enumeration of deficiencies and corrective actions forms in effect a method to generate options or initiatives (See Figure VIII-4). We first list the technical, organizational and institutional deficiences of the current system in achieving the desired attributes. A list of candidate options and initiatives addressing these deficiencies follows, which are then analyzed and discussed in Chapter IX.

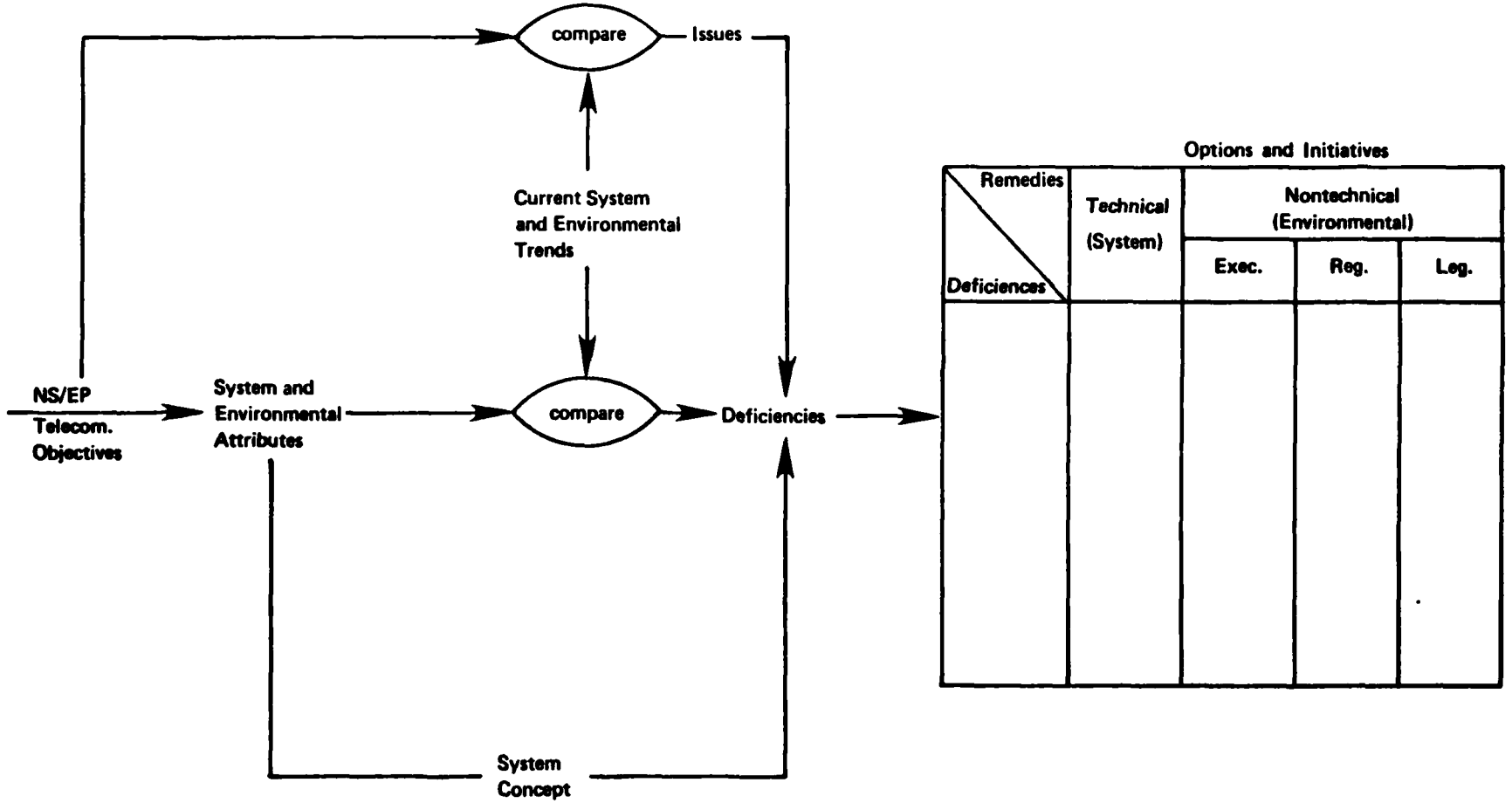

Figure VIII-4 GENERATION OF OPTIONS

High Network Availability

Deficiencies

(1) Critical network elements lie within targeted areas. This vulnerability stems in part from the hierarchical nature of the public telephone system and from new, highly centralized functions like CCIS and network control.

(2) With only minor exceptions, elements in non-targeted areas are inadequately protected or given long-term emergency support. Included are vulnerabilities to EMP, no protection of personnel, insufficient low-echelon interconnectivity, inadequate emergency power, and inadequate restoration procedures and facilities when damage is widespread.

Broad and Controllable Network Access

Deficiencies

(1) While the core system offers excellent and broad accessability (one principal reason to adopt its use in NS/EP), it lacks control to that access; that is, ways to assure that authorized access in emergencies can take precedence over or preempt public use of, for example, a central office.

(2) Privileged access to certain facilities suggests a subsequent and concomitant need to be able to secure a precedence route. This ability does not now exist.

Responsive Network Control

Deficiencies

(1) A tendency toward greater centralization of control creates a substantial vulnerability. The present, more distributed control methods should be examined for retention. Responsive control means extensive network monitoring is needed. The resulting information should be broadly accessible in the network.

(2) Highly-talented, well-trained teams, capable of binding a variety of system elements together are needed. Somewhat counter to today's trend would be the training and excercising of special teams that had broad familarity with network elements and how to regain control of a fragmented network. This would likely involve special supplemental breakout and transmission equipment and especially dedicated order wires.

Extensive Interoperability Among Member Networks

Deficiencies

(1) Present networks (mission oriented, core network, CCCs and others) have only very limited connections between each other. This could lead to their being totally separated from each other in emergencies and war. A possible exception is that many networks can enter the PTS.

(2) The profound lack of internetwork standards makes future cross connections less likely. This includes both voice and data (protocol) standards, the latter being important as computer traffic increases.

Flexible Degrees of Preemption

Deficiencies

(1) Most elements of the core network are designed to be shared and are sized in response to anticipated demand (and a given level of service). Planning for an ability to flexibly preempt telecommunications for government use during an emergency is lacking. Also, no one knows how much preemptive capacity is required for various emergencies or a war.

Wide Range of User Services

Deficiencies

(1) Because of the circuit basis of the core network, all user services (e.g., data, facsimile, graphics, and encryption) are provided on an end-to-end basis. This is not necessarily a deficiency unless the users expect performance beyond that appropriate to the present available service. Since the performance standards of the core network are oriented for non-secure analog-voice, new services and performance standards may need to be created.

(2) Ideally a network such as NSTS would evolve appropriate network interfaces for a wide variety of terminal equipment. Whether Bell's DDS, forthcoming ACS, or a value-added network can be considered appropriate for NSTS data requirements has not been examined.

Appropriate Legislative Basis

Deficiency

(1) Other than a brief mention of national security in the Communications Act of 1934, Congress has given NS/EP little attention relative to the telecommunications industry. While increased attention could be given under present law, new, more explicit legislative guidance would be better.

Centralized NS/EP Telecommunications Policy

Deficiency

(1) NS/EP telecommunications policy development is fragmented and uneven within the Federal Government. Ambiguities between DOD and civilian agencies need to be eliminated and a single, high-level spokesman needs to be identified.

Authoritative Executive Direction

Deficiencies

(1) There is presently ambiguous authority for communications from the President to the military, State Department, civilian agencies, state and local governments, and the public. This ambiguity is exacerbated by dispersed organizational and budgetary policy.

(2) No specific plans exist for the preemptive use of civil sector communications. A clearer picture needs to be drawn.

Comprehensive Network Planning and Management

Deficiencies

(1) NS/EP telecommunications needs to be assigned to a single organization that will create and maintain an NS/EP telecommunications capability. While NCS has certain wartime powers to help administer the government's telecommunications assets, it is not clear that it is now equipped to do so if called upon.

Competent Network Operation

Deficiencies

(1) The trend toward deregulation and unbundling of services could leave no carrier with the comprehensive knowledge of the broad and ubiquitous system capability needed. Competent operation and maintenance of an NSTS requires a single, knowledgable entity whose stability is assured and who is vitally involved in the ongoing improvement of the system.

Supportive Regulatory Environment

Deficiencies

(1) The regulatory environment is defined by the FCC under possible pressures from legislation, other government agencies, industry, and the public. Even with present legislation, the FCC pays too little attention to maintaining or creating an adequate NS/EP capability.

From these deficiencies a list of candidate changes, such as those shown in Table VIII-4 can be created.

Table VIII-4

LIST OF POLICY OPTIONS AND INITIATIVES

High Network Availability

(1) (REG) - Create incentives for geographical dispersion of facilities
(2) (REG) - Retain and enhance capability for distributed control
(3) (REG) - Create incentives for a better survivability and restoration capability
(4) (LEG) - Create subsidies for NS/EP enhancements
(5) (REG) - Create incentives for retaining associated signaling as a backup for CCIS.
(6) (REG) - Create incentives for installing EMP protection
(7) (REG) - Create incentives for installing backup power

Broad and Controllable Network Access

(1) (REG) - Create incentives for preparation of controlled network access.
(2) (REG) - Create incentives for establishing and verifying precedence calls.

Responsive Network Control

(1) (REG) - Create incentives for either maintaining control lower in the hierarchy or have automatic dynamic, distributed control
(2) (REG) - Create incentives for retaining dispersed network management and restoration teams
(3) (REG) - Create incentives for remote network monitoring

Extensive Interoperability Among Member Networks

(1) (REG) - Define and enforce a set of voice and data interconnection standards
(2) (REG) - Create incentives for interconnection with the other common carriers and private systems.

Flexible Degrees of Preemption

(1) (REG) - Create incentives to permit equipment and software modifications that allow a variable degree of preemption of switching and transmission facilities.
(2) (REG) - Define criteria for determining the degree of preemption for various levels of emergency.

Wide Range of User Services

(1) (NSC) - Define the range of data, voice, and other services along with performance criteria appropriate to various emergency activities
(2) (NCS) - Monitor network performance of user-oriented services.

Appropriate Legislative Basis

(1) (LEG) - Provide basic service on a regulated monopoly basis.
(2) (LEG) - Create stronger imperatives to the FCC in matters of NS/EP.
(3) (LEG) - Give the Executive Branch peacetime authority to require common carriers to: provide needed services, universal inter-connection, network management, and planning.
(4) (EXEC/LEG) - Create an executive agent for NS/EP purposes.
(5) (EXEC) - Have the President appoint an NS/EP commissioner for the FCC.

Centralized NS/EP Telecommunications Policy

(1) (LEG) - Create a cabinet-level department of telecommunications.
(2) (EXEC) - Establish a telecommunication policy unit in the Executive Office of the President.
(3) (EXEC) - Establish a presidential assistant for NS/EP telecommunications policy.
(4) (LEG) - Form a new telecommunication agency in the Executive Branch.
(5) (EXEC) - Establish a telecommunication agency within an existing department.

Authoritative Executive Direction

(1) (EXEC) - Augment the Secretary of Defense as executive agent.
(2) (EXEC) - Create a new DoD organization for NS/EP communications under the Secretary of Defense.
(3) (EXEC or LEG) - Create a new non-DoD agency and executive agent.

Comprehensive Network Planning and Management

(1) (NCS) - Specify planning and management to be done by the executive agent.
(2) (REG + NCS) - Specify planning and management to be coordinated between the common carriers and executive agent.
(3) (REG) - Specify planning and management to be done by a permanent FCC-sponsored government/industry panel.
(4) (NCS) - Contract for planning and management assistance.
(5) (NCS) - Create in-house architecture and management teams with attendant procurement and monitoring capability.

Competent Network operation

(1) (LEG or REG) - Affiliate carriers for NS/EP purposes.
(2) (LEG or REG) - Affiliate dominant carrier(s) for NS/EP purposes.
(3) (LEG or REG) - Permit common carriers subsidiaries to operate a survivable national telecommunications system.

Supportive Regulatory Environment

(1) (REG) - FCC issue a notice of inquiry of the impact of deregulation and competition on NS/EP.
(2) (REG) - FCC submits annual report to Congress on NS/EP capability.

(3) (REG) - FCC commissioner designated for NS/EP responsibility.
(4) (EXEC)- Submit proposed rules to FCC on implementing PD-53.

Reasonable Cost and Schedule

(1) (REG) - Create special depreciation schedules for approved equipment.
(2) (NCS) - Develop criteria for allocation of NS/EP costs.
(3) (NCS) - Develop realistic schedules for NS/EP enhancements with priorities based on those that are needed most.

Feasible Financing Method

(1) (EXEC) - Define NS/EP capability as line item in DoD budget.
(2) (REG) - Include some NS/EP costs in the carriers' rate bases.
(3) (LEG) - Provide tax incentives to carriers to add NS/EP enhancements.

REFERENCES

1. Lomax, J.B., Rubin, D., "New Concepts in Survivable Communications Networks," Final Report, Contract DNA 001-79-C-0338, SRI International, Menlo Park, Calif., to be published.

2. Ibid.

IX. CANDIDATE POLICY OPTIONS AND COURSES OF ACTION

A. Introduction

Before discussing the various policy options or initiatives that could be taken, it is helpful to restate what is being attempted. From the preceding development several points emerge:

- An increased reliance on the common carrier networks for critical NS/EP circuits, accompanied by a neglect of the capability of these networks to endure a nuclear attack on the United States, raises serious questions about their ability to function during the time they may be truly needed for national survival. Recognizing the vital importance of communications, that failure must be viewed as a fundamental flaw in our overall defense strategy.

- To increase the capability of our common carrier networks to meet NS/EP objectives requires better understanding of how to cope with a rapidly changing telecommunications industry and regulatory environment.

- A telecommunications system that meets our survivability, restorability, and interoperability needs is technically feasible. The question is how to develop it, and that begins with a determined formulation of NS/EP telecommunications policy.

Thus, our task is to explore and better understand the range of policy options that could help create a more credible NS/EP telecommunications capability. The previous chapter concluded that any practical solution involves the public telephone system. Therefore, the policy options considered here are in some way related to that conclusion.

This chapter establishes four policy frameworks that encompass various regulatory and legislative initiatives that could be taken. A policy framework, as used here, is a group of mutually consistent regulatory and legislative initiatives.* The four frameworks are outlined and their

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* The terms initiative and option are used interchangeably.

advantages and disadvantages are discussed. First, however, we will present several initiatives designed to address resource and organizational deficiencies in the Executive Branch's ability to develop the desired NS/EP telecommunications capability. These initiatives would be generally applicable regardless of which policy framework is subsequently considered in latter sections. Then, after describing and discussing each of the policy frameworks, this chapter closes with a section on various technical initiatives that could be taken to enhance the NS/EP performance of common carrier networks. We now turn to the Executive Branch initiatives.

B. Executive Branch Initiatives

Two categories of initiatives are discussed in this section: those related to rationalizing the essential NS/EP telecommunications functions in the Executive Branch and those related to strengthening the NCS.

1. Rationalizing the Essential Functions

Centralization of Executive Branch NS/EP Policy Functions. As discussed earlier, responsibility for developing policies related to NS/EP activities in the Executive Branch is fragmented.* To centralize NS/EP telecommunications policy development in the Executive Branch, Congress and/or the President could assign this responsibility to:[1]

- A new cabinet-level Department of Telecommunications;
- A telecommunications policy unit in the Executive Office of the President;
- An assistant to the President for NS/EP telecommunications policy;
- A new independent telecommunications agency; or
- An agency within an existing department.

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* Reorganization Plan No. 1 of 1977 requires that all telecommunications policymaking (not policy development) functions derived from abolishing OTP remain in the EOP (see chapter III).

The cabinet-level department and the policy unit in the Executive Office of the President could address a broad range of telecommunications issues including NS/EP concerns. A presidential assistant could focus on NS/EP issues, while an independent agency or an agency in an existing department could be organized specifically for NS/EP, for government telecommunications, or for national telecommunications policy.*

The following specific responsibilities could be considered for assigning to whichever organizational form is chosen to centralize NS/EP telecommunications policy development functions, in addition to general liaison and coordination duties:**

- Coordinate with the National Security Council on the development of policy, plans, programs, and standards for the mobilization and use of telecommunications resources during emergenies and assist in the policy direction of the National Communications System.
- Assume the National Telecommunications and Information Administration's role regarding formulation of policies for interoperability and emergency readiness.

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* With the exception of the cabinet-level department, each of these options either once existed or now exists in the government. The Office of Telecommunications Policy, which was created in 1970 and abolished in 1977, is an example of a policy unit in the Executive Office of the President. The Director of Telecommunications Management during the Kennedy and Johnson administrations in the Office of Emergency Preparedness is an example of a telecommunications advisor in the Executive Office of the President with broad responsibilities over policy in the Executive Branch. The Federal Emergency Management Agency is an independent executive agency that has emergency preparedness telecommunications responsibilities. The Department of Commerce's National Telecommunications and Information Administration is an agency within an existing department with telecommunications functions. Also, the head of a cabinet-level department, an independent telecommunications agency, or even a telecommunications agency in an existing department could serve as a presidential telecommunications advisor. The presidential advisor need not be in the Executive Office of the President.

** See Appendix A regarding E.O. 12046.

- Replace the Director of the Office of Science and Technology Policy in assuming the war power functions under Plan D and in performing the policy functions regarding evaluating NS/EP capabilities of existing and planned telecommunications systems.*

- Coordinate with OMB on the development of procurement and management policies for Federal NS/EP telecommunications systems.

- Coordinate with the Director of the Federal Emergency Management Agency and the Secretary of Commerce on the development of policies, plans, programs, and standards for emergency use of telecommunications.

Authoritative Direction and Financing. The current fragmented policy development leads to unclear missions, diffuse authorities, and inadequate resources to develop and direct a NS/EP telecommunications capability. Three options that could help establish effective executive direction for NS/EP telecommunications are to:

- Continue the Executive Agent responsibilities for the NCS in the Secretary of Defense, but with augmented NCS resources so that it could better develop and direct the required NS/EP telecommunications capability.

- Replace the NCS with a new organization having substantially strenghtened authority to deal more effectively with problems of harmonization and coordination, with the Secretary of Defense remaining the Executive Agent.

- Create such a successor agency to NCS as described above outside of DoD, with a non DoD Executive Agent.

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* There is precedent for delegating war power functions outside of the EOP. By Executive Order No. 10312 issued December 10, 1951, the President delegated to the FCC, subject to certain specific limitations, the authority vested in him by Section 606(c) with respect to radio stations, except those owned and operated by any department or agency of the United States Government. With respect to the latter stations, the authority vested in the President by Section 606(c) is delegated, subject to certain specific limitations, to the head of each department or agency owning or operating a radio station. However, the delegation of the OSTP Director's role as central Federal telecommunications resource manager is not consistent with all of the organizational forms suggested for centralizing NS/EP telecommunications policy development.

Mirroring the fragmentation of policy development for NS/EP objectives is the scattering of NS/EP budget items throughout the Federal budget. This diffusion of budget authority could be greatly relieved by including it principally as a line item in the DoD budget and supplementing it, as appropriate, in the budgets of the other participating agencies.

Comprehensive NS/EP Network Planning and Management. Network planning and management is complicated by the number and variety of member NS/EP networks. The resources of established common carriers, other common carriers, and government and private systems must be planned, coordinated, and managed to achieve and maintain the required NS/EP capabilities. Options for rationalizing network planning and management are to assign this responsibility to:

- The Federal Government;
- An FCC sponsored industry/government council;* or
- An established carrier, consortium of carriers or a separate subsidiary of an established carrier.

2. Strenghtening the National Communications System

If NCS is "to provide necessary communications for the Federal Government under all conditions ranging from a normal situation to national emergencies and international crises, including nuclear attack," as its enabling Presidential Memorandum[2] declares, the agency's authority, organization and resources should be enhanced. Several steps could be taken to help NCS achieve its mission. These steps could also help NCS

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* The council could serve as a forum to develop and promulgate standards and procedures on such questions as interconnection, interoperability, system planning, target avoidance, restoration procedures, and network management. Also, the council would provide an antitrust umbrella for competitive carriers to engage in joint planning for NS/EP purposes. Since the council's primary objective is network planning and management for NS/EP telecommunications, it could be chaired by NCS. The effectiveness of such a council would depend on a number of factors such as: the incentives for industry to cooperate, strong leadership, and, most importantly, mechanisms to pay for NS/EP enhancements.

offer needed analytical support for NS/EP telecommunications policy development and evaluation. With such a capability, NCS could support NS/EP policy development in the Executive Office of the President. However, before listing the initiatives that could be taken to achieve this capability, we point out an important current opportunity for analytical policy support: PD-53 rulemaking.

PD-53 Rulemaking. Acting through the National Security Council (NSC), NCS could submit a set of rules to the FCC to ensure that the carriers' networks achieve survivability, interoperability, and restorability as envisioned by PD-53.[3] The FCC could then conduct an inquiry and proposed rulemaking proceeding on the basis of the NCS submission.* We now list four initiatives that could strengthen analytical capabilities within the NCS.

Network Management. A network management analysis capability could be formalized in the NCS structure that would develop engineering, technical, procedural, and management practices and standards to achieve interoperability and network control among component networks of the NCS.

Procurement Analysis. This would require that NCS analyze the impact of different procurement strategies on the survivability, restorability, and interoperability of NS/EP telecommunications networks.**

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* In the current regulatory scheme, the NCS could choose to file objections with the FCC against microwave or satellite system licenses or Section 214 authorizations that did not provide adequate target avoidance, interconnection and reconstitution provisions as required by PD-53.

** If competitive trends continue, obtaining telecommunications services and facilities will become more complex. The sources of supply and the variety of services and facilities are both growing. The Federal Government, including NCS, relies heavily on TELPAK, a bulk purchase of transmission services that is being phased out. OMB encourages government agencies to rely on the private sector in ordering services and facilities.[4] Such an analysis may become increasingly important if, in response to competition, established carriers unbundle various facilities and services intended to increase the endurance and integrity of their networks during emergencies.[5]

Endurance Analysis. NCS could also analyze, validate, and advise on overall requirements for survivability, restorability, and interoperability of the NCS networks. This would expand NCS' current responsibilities in administering the restoration priority system.

Monitoring and Testing. NCS could monitor and analyze changes in the NCS networks for their impacts on NS/EP telecommunications capabilities. The monitoring function could be augmented by modeling efforts and periodic testing of the NCS networks.

C. The Policy Frameworks

Having considered a range of Executive Branch initiatives, we will now turn to various regulatory and legislative initiatives. These are to be organized into four policy frameworks. The frameworks have legislative bases that differ from one another, but all of them share the common goal of achieving the desired NS/EP capabilities. These policy frameworks are clearly idealizations. They serve to identify and organize the advantages and disadvantages of alternate courses of action while shedding light on the key issues and their interrelationships. The four policy frameworks are:

- Current Regulatory Framework. This is based upon the status quo -- namely, the existing NS/EP provisions of the Communications Act of 1934 as interpreted and administered by the FCC and the courts.

- Modified Regulatory Framework. In this alternative, the Communications Act of 1934 would be amended to specifically guide the FCC regarding the regulation of common carrier facilities and services for NS/EP purposes. Such an amendment could be part of a larger effort to amend the 1934 Act, as in, for example, the recent bills, HR 6121 and S 2827 in the last Congress.

- Presidential Authority Framework. In the third case, the President would be granted direct peacetime authority over communications carriers for NS/EP. Such authority could be granted to the President by expanding the war powers section of the Communications Act of 1934, granting him Section 214 authorities, or by amending the Defense Production Act of 1950.

- Monopoly Structure Framework. In the fourth alternative, the Communications Act of 1934 would be amended to require that basic telecommunications services be a regulated monopoly.

The four policy frameworks are listed in ascending levels of regulatory authority over the telecommunications industry. The first two rely on existing or modified regulatory structures. The third bypasses the existing regulatory apparatus and gives the President direct authority over the industry to develop the required NS/EP capability. The last approach would pursue NS/EP objectives in a protected monopoly market for basic telecommunications services. Although the discussion suggests four alternative strategies, the policy frameworks are not mutually exclusive; any initiative can fit more than one framework. Each of the following four sections is devoted to one of the policy frameworks. The first part of each section describes the policy framework; the second part of each section then discusses the advantages and disadvantages. While it is highly desirable to clearly separate descriptive and evaluative material as we have here, the separation requires some redundancy to recall important information in the discussion sections. We begin with the current regulatory framework.

1. Current Regulatory Framework

a. Description

This policy approach relies on the current regulatory framework to achieve NS/EP telecommunications objectives. It assumes that the Communications Act of 1934 will not be modified. In particular, it assumes that the President's emergency war powers and the legislative basis for regulating the common carrier industry remain unchanged. Since the initial steps taken to improve NS/EP telecommunications will necessarily occur in the current regulatory framework, it is helpful to describe and discuss this framework in some detail.

In the general realm of telecommunications policy, the FCC has sought to introduce new technologies, encourage diverse and innovative services, eliminate cross subsidies among services, and establish a closer

relationship between a service's price and the carrier's cost to provide it. Consequently, it is presumed that the competition already established in the intercity telecommunications and customer-premises equipment markets will continue in this framework. A review of a few salient features of this trend toward increased competition will be helpful.

The current policy framework has established new industries like interconnect companies, domestic satellites, and special common carriers. Recent FCC decisions will continue to support this competitive trend, if they withstand court challenges. The FCC reached a final decision in the Second Computer Inquiry[6] on April 7, 1980. The decision deregulates the provision of enhanced services and customer premises equipment and allows AT&T to compete in both of these markets provided it does so through a separate subsidiary. In the MTS/WATS Market Structure Docket,[7] August 1, 1980, the Commission decided not to require MTS and WATS to be offered on a sole source basis, thus withdrawing the established intercity common carriers' defacto monopoly. The Commission adopted new rules for nondominant carriers on October 28, 1980.[8] They do not have to provide economic data to support their tariffs, can change their rates on a 14 days' notice rather than the 90 days required of dominant carriers, and can obtain a blanket authorization for their facilities instead of individual authorization for each segment of their networks.

While the Bell system will continue to be the largest firm in the telecommunications industry for the foreseeable future, the present regulatory framework could permit other financially strong carriers to prosper. Firms like Satellite Business Systems (SBS) and Xerox (XTEN) plan to offer intercity services. Traditional telephone companies like GTE and Continental are now active in the intercity market. Meanwhile, Bell has begun to reorganize to meet the new competition.

Table IX-1 summarizes an SRI projection of the revenues likely to be captured by various carriers in a competitive intercity telecommunications market by 1990. While it shows competitors with 5 to 6 percent of the market, some analysts predict they could capture as much as 20 percent of the total intercity market.[9]

TABLE IX-1

ANALYSIS OF U.S. INTERCITY* TELECOMMUNICATIONS REVENUES

	$ IN BILLIONS				AAGR (IN %)		
	1975	1980	1985	1990	75-80	80-85	85-90
1. AT&T	13.55	24.73	44.56	78.60	12.8	12.5	12.0
a. U.S. Toll (MTS)	10.84	18.82	31.29	50.39	11.7	10.7	10.0
b. WATS	1.43	3.69	9.18	21.00	20.9	20.0	18.0
c. Private Line (Toll & Local)	1.28	2.22	4.09	7.21	11.6	13.0	12.0
2. INDEPENDENT TELCOS	2.54	5.75	13.01	29.80	17.8	17.7	18.0
a. Toll (MTS)	2.46	5.38	12.05	27.6	16.9	17.5	18.0
b. WATS	.08	.37	.96	2.2	35.8	21.0	18.0
3. COMPETITIVE SERVICES	.054	.625	2.507	6.200	-	29.8	19.9
a. SWITCHED SERVICES	.003	.291	1.500	3.700	-	38.8	19.8
ITT/USTS	.003	.018	.20				
MCI	-	.130	.50				
SP	-	.140	.60				
WU	-	.003	.10				
Others (e.g. SBS)	-	-	.10				
b. PRIVATE LINE	.030	.117	.230	0.500	-	14.5	16.8
ITT/USTS	-	.023	.07				
MCI	.025	.055	.11				
SP	.005	.039	.05				
c. VANS	.005	.085	.380	1.000	-	34.9	21.4
ITT/DTS	-	.003	.05				
Graphnet	.005	.017	.03				
Telenet	-	.030	.15				
Tymnet	-	.035	.15				
d. DOMESTIC SATELLITES	.016	.132	.397	1.000	-	24.6	20.3
Westar	.011	.027	.047				
Amsat	.003	.020	.075				
RCA	.002	.042	.095				
SBS	-	-	.100				
COMSAT (for AT&T & GTE)	-	.043	.030				
Others	-	-	.050				
4. GRAND TOTAL	16.144	31.105	59.977	114.600	14.0	14.0	13.8
COMPETITIVE TOTAL SHARE (Line3/Line4)	0.3%	2.0%	4.2%	5.4%			

*Note: Does not include Record Carriers, Int'l Carriers, MCC, RCC, Offshore Carriers, Comsat Int'l Revenues, Overseas, Alaska, Hawaii.

AAGR = Average Annual Growth Rate

Intercity telecommunications is highly concentrated in the larger metropolitan areas. Calls between the 16 largest metropolitan areas generate more than 30 percent of MTS/WATS interstate business revenues, while those between the 32 largest metropolitan areas account for more than 50 percent of MTS/WATS interstate business revenues.[10] It is here that competition will be the greatest.

The use of high capacity transmission and electronic switching systems will lead to the addition of innovative information transfer services to the currently available voice and data services. Such innovations as ACS, XTEN, and SBS represent important new services in the developing market.

An important consideration in the current regulatory framework is the question of economic and/or technical harm to the network allegedly caused by competition. In Docket 20003,[11] a broad inquiry into the effects of competition in both the interstate private line and terminal equipment markets, the FCC concluded that such competition would not economically harm the established carriers. Similarly, in the First Report and Order in Docket 19528,[12] the Commission determined that registering terminal equipment interconnected with the network would protect against technical harm. Some members of the industry believe, however, that significant economies of scale exist in the provision of interexchange services that would not be achieved in a competitive environment. This issue may come up again in future FCC inquiries as competition develops and better data and analyses become available.

Questions of economic and technical harm take on added dimensions when common carrier networks provide services critical to various NS/EP applications. National security spokesmen are concerned that competition could lead to inadequate facilities to support NS/EP telecommunications needs. They argue that, to remain competitive, carriers have begun to eliminate various procedural and facility features designed to improve the likelihood that their networks could survive natural

disasters and/or military attack.* In response, the Commission recently concluded in the MTS/WATS Market Structure Docket[13] that:

> "33. We do not believe that it will be necessary to restrict competition or to impose special design requirements upon the carriers in order to meet national defense or other emergency needs. Any or all of the carriers in competitive markets will presumably be able and willing to provide any national defense facilities which taxpayers are willing to finance."
>
> "34. In any event the record does not demonstrate that unrestricted competition in interstate interexchange services will produce any detrimental effect upon the national defense or the safety of life and property."

The issue of joint planning to meet NS/EP telecommunications needs among competing carriers was also surfaced in the MTS/WATS Market Structure Docket. NCS pointed out the need for (and the difficulty of planning for) a range of emergencies from local disasters to nuclear war when several competing carriers independently develop facilities. While recognizing the need for joint planning, the Commission was not convinced that it should create a joint industry/government organization to effect planning as suggested by NCS.[14] Table IX-2 lists some of the key FCC actions occurring over the last decade that have or will affect the provision of services and products for NS/EP telecommunications.

Thus, the current regulatory framework depends largely on what the FCC does. The Communications Act of 1934 gave the FCC broad regulatory and policy powers over common carriers.[15] Over the past decade the Commission has used these powers to change the industry's market structure. In this policy approach, the discretion granted to the FCC by

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* It is also possible that carriers may decide to charge for certain network services and facilities that enhance the survivability, restorability, and integrity of their networks and offer them under a variety of different procurement options. Such action by the carriers would coincide with both the Commission's efforts to establish a closer relationship between the price and cost of a service and corporate needs in a competitive marketplace.

Table IX-2

SOME KEY FCC ACTIONS AFFECTING THE PROVISION OF NS/EP TELECOMMUNICATIONS

DATE	DECISION	IMPACT	AT RISK
June 3, 1971	Special Common Carrier Docket 18920 * First Report and Order	Adopted rules that significantly limit the number of protection channels allowed on microwave radio links.	An adequate number of spare channels to restore critical circuits in emergencies.
Jan 19, 1976	Revisions of Tariff FCC No. 260 Private Line Services, Series 5000 (TELPAK) Docket 18128 Recommended Decision of the Chief, Common Carrier Bureau	Elimination of TELPAK private line tariff.	$10 million increase in monthly cost for government communications.
May 2, 1980	Second Computer Inquiry Docket 20828 Final Decision	Requires AT&T to establish separate subsidiaries for the provision of enhanced services and customer-premises equipment.	Alters government/carrier relationships for the provision of enhanced services and customer-premises equipment.
Aug 26, 1980	MTS and WATS Market Structure Docket No. 78-72 Report and Third Supplemental Notice of Inquiry and Proposed Rulemaking	Withdrew de-facto monopoly in interstate interexchange basic services enjoyed by the established carriers.	Adequate redundant facilities, spare channels, and protective switching. Adequate mechanisms for government/carrier planning and for joint planning among carriers.

* The FCC terminated this proceeding on June 25, 1980 with the decision not to adopt standards for quality and reliability for competitive services (Final Report and Order).

the Communications Act of 1934 is the basis for the Commission unilaterally encouraging development of the desired NS/EP telecommunications capability. The FCC regulates interstate and foreign commerce in communications to assure the availability of adequate communications for, among others, the "purpose of the national defense" and for the "purpose of promoting safety of life and property."[16] Thus, the Commission appears to share in the responsibility of achieving the goals of NS/EP telecommunications.

The FCC could pursue several initiatives to create a regulatory environment that would help attain NS/EP telecommunications objectives. In what follows, we list nine initiatives that the FCC could take in the current regulatory framework.

Designate an NS/EP Commissioner. According to Federal Regulations[17] the FCC must designate a defense commissioner and two alternate defense commissioners. The defense commissioner keeps the Commission informed on emergency preparedness, mobilization and defense activities that relate to telecommunications policy matters and represents the Commission with other agencies having NS/EP responsibilities. In addition, the defense commissioner is responsible for plans regarding the Commission's continuity of government responsibilities, as well as approving the plans of industry for providing services during a national emergency. Recently, the FCC Chairman has assumed those responsibilities and then delegated them to a staff member, thus diminishing the defense commissioner's role. To remedy this state of affairs, the Commission could designate an NS/EP commissioner with appropriate expertise and authority whose primary function would be to assure that the NS/EP responsibilities of the FCC are discharged.

Issue a Notice of Inquiry on NS/EP Impacts of Competition. In Dockets 19528 and 20003, the Commission explored issues of technical and economic harm to the network as a result of making the interstate private line and terminal equipment markets more competitive. These were very broad ranging inquiries. Nonetheless, they did not explore how NS/EP telecommunications capabilities would be affected by altered economic and technical environments engendered by competition. Neither the Commission

nor NS/EP spokesmen encouraged addressing this question. The initiative suggested is that the Commission open a Notice of Inquiry into the impacts of competition on NS/EP telecommunications.

Sponsor an Industry/Government Council on Standards and Network Planning. In this option, the FCC would sponsor a joint industry/government council on standards and network planning for NS/EP telecommunications. The council would serve as a forum to develop and promulgate standards and procedures on such questions as interconnection, interoperability, system planning, target avoidance, restoration procedures, and network management. Also, the council would allow competitive carriers to engage in joint planning for NS/EP purposes without violating Federal antitrust laws.

On the government side, the council could include all Federal agencies responsible for NS/EP telecommunications plus representatives of state regulatory and emergency preparedness organizations. Industry membership could include all regulated and unregulated carriers as well as equipment manufacturers.

At present, the Commission hosts periodic meetings among competitive carriers to resolve interconnection questions pursuant to the settlement agreement approved by the FCC in Docket 20099.[18] Also, the Commission established the National Industry Advisory Committee (NIAC), which helps the FCC in matters regarding emergency communications, such as developing rules for the restoration of services in emergencies. Although these mechanisms are inadequate for the purposes of this option, the experience with them would be useful in establishing the council.

Enforce Standards for NS/EP. Here, the FCC would require carriers to meet various standards that would enhance their networks' NS/EP capabilities. Such standards could be enforced when the Commission approves new or added facilities or when it grants or renews radio licenses. The standards could be designed to improve the survivability, interoperability and restorability of the various networks operated by the carriers. They could be developed by or with the help of the industry/government council discussed above.

Issue an Annual Report to Congress on NS/EP Impacts. The Communications Act of 1934 requires the FCC to report annually to Congress on their regulatory activities.[19] In this option, the Commission would independently report to Congress on the impacts of its regulatory activities on NS/EP telecommunications capabilities. This report would go a step further than the proposal by the National Telecommunications and Information Administration,[20] which suggested that the FCC report annually to Congress on conflicts between national security and competition. The development of such a report could be a primary responsibility of the proposed NS/EP commissioner. The report could also be the subject of annual hearings held by the appropriate congressional committees.

Institute Depreciation Incentives. To encourage the use of equipment and facilities that meet technical specifications for NS/EP needs, an incentive program could be instituted in which carriers would more rapidly recover any capital invested in equipment that is replaced by new equipment that meets new FCC standards. Such depreciation schedules would allow carriers to recover such costs through their rates. The class of standards could emcompass blast, shock, radiation, and EMP protection, as well as interconnection standards. The application of such incentives must not penalize carriers who comply, however, by decreasing their market share through higher rates.*

Include Some NS/EP Costs in the Rate Base. The established common carriers have already instituted measures to enhance the survivability and restorability of their networks.[21] These include: avoiding likely targets in constructing new elements of the network; establishing diverse routes between key nodes of the network; incorporating

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* See section on Depreciation Charges in the Committee Report on HR 6121 (Ref. 20) for a brief discussion of the impact of competition on capital recovery for the regulated carriers.

the capability to choose alternate routes through the network; protecting people and equipment from blast, heat, and radiation; providing backup equipment; developing plans to restore critical circuits;[22] and promulgating plans and procedures to manage crisis situations. The industry feels that these measures protect services used by the general public as well as government agencies. Thus, the costs for these measures have appeared as common costs in the revenue requirements of the common carriers; that is, these costs are not specifically allocated to particular services.

In this option, the FCC would encourage the carriers to continue to include some of these costs in their rate bases. Again, care must be exercised so that carriers who comply are not disadvantaged in a competitive marketplace. Costs associated with unique national security requirements presumably could be covered by special tariffs or contractual arrangements.

Levy Access Charges. The access charge option is a companion to the above option. Here, the FCC would levy charges or surcharges on all carriers that access the core network. The access charges can then be used to help defray the common costs of survivability, restorability, and interoperability measures for the core network. The access charge approach could help isolate financial NS/EP needs from changes in the industry structure if a means can be found to equitably distribute their costs among the carriers. This question could be addressed in an FCC Notice of Inquiry.

Establish NS/EP Branch in the Common Carrier Bureau. To support the initiatives outlined above, the FCC could establish an NS/EP Branch in the Common Carrier Bureau.

b. Discussion

Most likely, the current regulatory framework is what shapes up for the telecommunications industry in the near future. Efforts to change the Communications Act of 1934, including possible amendments for

NS/EP purposes, will probably be delayed as a result of the 1980 congressional elections as committee leadership and makeup changes.[23] For now, industry structure is more likely to be affected by the recent FCC Computer Inquiry II decision[24] and the proposed rule-making[25] for classifying dominant and nondominant carriers than by legislative initiatives. Thus, the current regulatory framework's value is as a short-term strategy; it could serve as a precursor or an interim arrangement to initiatives in the other frameworks.

Another advantage of the current regulatory framework is its reliance on existing legislative and regulatory structures which are very difficult to alter. This is especially true for any change in Title II legislation regarding common carrier regulation. For example, legislative changes in Title II provisions proposed for NS/EP purposes would probably elicit other amendments, unrelated to NS/EP telecommunications. Its passage would be difficult and the goals of NS/EP telecommunications could be confused with extraneous and contentious issues.

Finally, the advantages claimed for competition regarding innovation and efficiency would presumably be given some opportunity to develop and accrue to all telecommunications users in this framework, including those with NS/EP responsibilities. Proponents of competition argue that NS/EP telecommunications would benefit from the robust and diverse services and facilities and efficiencies that are encouraged in a free marketplace.[26]

The current regulatory framework depends heavily on FCC actions. Since it is unclear what the FCC will do about NS/EP telecommunications in the current framework, there is regulatory uncertainty about how to develop and sustain common carrier resources that are survivable, restorable, and interoperable. This uncertainty regarding FCC actions is the principal disadvantage of the current regulatory framework's policy approach.

In addition to regulatory uncertainty, the current framework, without specific FCC action, lacks an effective mechanism for joint planning among carriers for NS/EP telecommunications facilities and services. It is necessary that the FCC address regulatory uncertainty and the lack of effective joint planning mechanisms among carriers for NS/EP telecommunications. FCC actions such as designating an NS/EP commissioner and sponsoring an industry/government council on standards and network planning will help achieve NS/EP telecommunications objectives in this framework. The industry/government council, however, is likely to be quite large and unwieldly. Active planning or the development of standards would have to be accomplished by smaller working groups or specific council members. Additionally, the efficacy of designating an NS/EP commissioner depends on the motivation and qualifications of the person appointed to the position.

Since establishing the legitimacy of NS/EP requirements for endurable telecommunications resources obtained from the common carriers falls on the Executive Branch in the current regulatory framework, a strong centralized policy-development capability for NS/EP telecommunications should be created. It must be able to coherently, consistently, and authoritatively present NS/EP telecommunications policies and analyses to the FCC and to the Congress. Such presentations must be consistent with other administration positions regarding national telecommunications policy. More effective mechanisms are needed than are available today to harmonize national telecommunications policy at a sufficiently high level in the Executive Branch. Given the complexity of telecommunications issues, the developing conflicts over national policy and the importance of telecommunications to the nation, it may be highly desirable to establish a telecommunications policy capability in the Executive Office of the President in the current regulatory framework.

There are various methods in the current regulatory framework to pay for NS/EP telecommunications capabilities. The costs for NS/EP telecommunications could be included as line items in the budgets of the appropriate executive agencies. Also, the FCC could allow some costs for enhancing the survivability, restorability and interoperability of

carrier networks to be included in the carriers' rate bases or expenses. Additionally, the FCC could institute depreciation incentives and access changes to help pay for NS/EP telecommunications enhancements. While the FCC could pursue such initiatives to help pay the costs for NS/EP telecommunications, the agency budget process is the primary means to pay for NS/EP telecommunications capabilities in the current regulatory framework.

NCS organization and resources are particularly important considerations in the current regulatory framework. The uncertain regulatory environment and the lack of formal mechanisms for joint planning among carriers may considerably exacerbate the difficulty of the NCS mission. Suggested NCS analytical capabilities in network management, procurement analysis, and endurance analysis as described earlier would not only help NCS achieve its mission, but also they could provide a policy-support capability for NS/EP telecommunications in the Executive Office of the President. NCS should develop a set of proposed rules for the common carriers to achieve the objectives of PD-53. These rules should be submitted to the FCC through the National Security Council. The proposed rules could then become the subject of a Notice of Inquiry and Proposed Rulemaking by the FCC.

Strong executive leadership is required to develop and maintain the desired NS/EP telecommunications capability in the current regulatory framework. Presently, such leadership falls to the Secretary of Defense as the NCS Executive Agent. Sustained, effective leadership requires policy direction and mechanisms to resolve conflicts and to delineate responsibilities between military and civilian emergency preparedness missions. The National Security Council provides policy direction in the existing NCS structure.* If policy development for NS/EP telecommunications is centralized in the Executive Office of the President, policy direction for the NCS could be broadened and enhanced.

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* See Appendix A.

2. Modified Regulatory Framework

a. Description

Compared with the current regulatory frameworks, the modified framework assumes that the Communications Act of 1934 would be amended to include specific policy guidance to the FCC regarding NS/EP telecommunications. Such guidance would require that the FCC not compromise vital NS/EP needs in pursuit of its other regulatory objectives.

In this framework, specific legislative guidance to the FCC regarding NS/EP telecommunications would not alter the Commission's authority over the carriers. Rather, the FCC would be directed to exercise its existing powers so that the required NS/EP telecommunications capabilities develop.

Under this framework, the Communications Act of 1934 could be further amended to establish a legislative basis for trends in the industry structure that have been upheld by the FCC and the courts. By and large, HR 6121 and S 2827 in the House and Senate respectively would establish such a basis. That is, the NS/EP policy guidance could be part of a larger effort to amend the Communications Act of 1934. Some or all of the following initiatives could be taken:

Draft Legislation. The Executive Office of the President, with the help of the NCS, could submit a draft amendment to the Communications Act of 1934 to the congressional Commerce and Armed Services committees that would serve to guide the FCC regarding NS/EP telecommunications.

Title I of the Communications Act of 1934 instructs the FCC to propose legislation that would help achieve the goals of the Act in its annual report to Congress. Using this mechanism, the FCC could draft an amendment that suggested policy guidance for NS/EP telecommunications.

The National Telecommunications and Information Administration (NTIA), following interactions with DoD, suggested the following policy guidance for NS/EP telecommunications in their primer on common carrier legislation:[27]

> "In order to meet the needs of national defense and security and emergency preparedness, it is declared to be the policy of the United States that all appropriate Executive Branch agencies through appropriate planning, procurement, and regulatory activities and in cooperation with interested state authorities shall foster the development, maintenance, and regulation of the Nation's operating telecommunications facilities and systems to promote, where necessary, their effective functioning under conditions of national emergency or national disaster."
>
> "The Commission upon request of the Executive Branch agencies is also required to evaluate the need for and take any regulatory action necessary to avoid significant adverse impact upon the ability of the Nation's telecommunications facilities and systems to function effectively under conditions of national emergency or national disaster, provided, however, that such regulatory action shall not significantly impair the achievement of other purposes of this Act as stated in Section ___. Further the Commission shall conduct an on-going inquiry into the nature and extent of any conflict between national defense and security and emergency preparedness and other purposes of this Act and shall report its findings annually to Congress."
>
> "The Commission, upon its own initiative or upon requests of any person, carrier, or agency of the United States Government, may establish and enforce such requirements with respect to the design, manufacture, and maintenance standards for telecommunications equipment and electronic equipment, including but not limited to all terminals, switching, signalling, and transmission components of any telecommunications network, intended to be employed as a part of or to be connected with any telecommunications network as are necessary to protect such network from unacceptable technical or operational harm, to promote the national defense and security and emergency preparedness, and to foster competition in the relevant telecommunications equipment, electronics equipment, information software and information services market or markets."

Congressional Hearings. Both the Senate and House Communications subcommittees could hold hearings on the subject of amending the Communications Act of 1934 to help guide the FCC regarding NS/EP telecommunications.

NS/EP Commissioner. In this option, the Communications Act of 1934 could be amended to require that the President designate one of the FCC commissioners as the NS/EP commissioner.

NS/EP Report to Congress. The Communications Act of 1934 could be amended to require the FCC to report annually to Congress on the impacts of their regulatory activities on NS/EP telecommunications capabilities.

Subsidies for NS/EP Enhancements. Legislation could establish subsidies to pay for various measures to improve the survivability, restorability, and interoperability of the common carrier networks. Such funds could be made available for an extended period of time so as to be immune to the vagaries of the annual budget cycle.

Favorable Tax Treatment. In this option, tax incentives could be given to carriers who install facilities that improve the survivability, restorability, and interoperability of their networks.

REA Support for Class 4 and 5 Office Interconnect. In this option, the Rural Electrification Act could be amended to allow REA to support interconnection among Class 4 and Class 5 offices owned by small independent telephone companies in rural areas.

GAO Evaluation of NS/EP Telecommunications. The Armed Services committees could request that the Government Accounting Office evaluate the effectiveness of existing programs in the Executive Branch and at the FCC to develop and maintain NS/EP telecommunications.

b. Discussion

The policy approach of the modified regulatory framework could resolve the principal difficulty of the current regulatory framework. The regulatory uncertainty for NS/EP telecommunications would be dispelled

by adding specific policy guidance, in the form of an amendment to the Communications Act of 1934, to the FCC regarding the parity of NS/EP telecommunications objectives with other regulatory goals.

The chief advantage of this policy approach lies in its efficacy. A very powerful mechanism to achieve NS/EP telecommunications goals is created by directing existing regulatory authority.

The policy approach in the modified regulatory framework requires that the FCC regulate the telecommunications industry so that NS/EP telecommunications capabilities can be developed and are not impaired or compromised. It is not known whether existing competitive trends will harm NS/EP telecommunications, especially if such trends are moderated by NS/EP requirements. Thus, the FCC may allow competition in this policy approach when it does not interfere with NS/EP telecommunications objectives. This approach offers a means, therefore, to achieve a controlled level of competition while ensuring a supportive regulatory environment for NS/EP objectives. Additionally, in this policy approach, the FCC would require all carriers to plan and operate their systems so that the survivability, interoperability, and restorability of their combined networks are enhanced.

The policy approach in the modified regulatory framework would be consistent with efforts to amend the Communications Act of 1934 in the 96th Congress. Policy guidance to the FCC regarding NS/EP telecommunications would balance proposed amendments to establish a statutory basis for the evolving competitive industry structure.

NTIA suggested policy guidance for NS/EP telecommunications in its primer on common carrier legislation. However, their proposal reveals a potential disadvantage of this policy approach. The suggested NTIA language, while supporting NS/EP requirements, instructs the FCC that regulatory action taken on behalf of NS/EP objectives "shall not significantly impair the achievement of the other purposes of this Act." Such policy guidance appears to beg the question of NS/EP telecommunications requirements and may relegate the responsibility of

significant compromises to the regulatory process. On the other hand, there are both political and policy difficulties with specifying detailed regulatory constraints in legislation that must withstand the test of diverse and changing circumstances over time.

Appropriately amending the Communications Act of 1934 so that effective NS/EP policy guidance modulates the regulatory process is the major challenge of the modified regulatory framework. The difficulty of the challenge is the principal disadvantage of this policy approach. Policy guidance must clearly establish primary NS/EP telecommunications goals while encouraging the industry to flourish as information services and products become increasingly important to society.

In the modified regulatory framework, the FCC must assure that the added burdens imposed by NS/EP purposes are equitably shared among all carriers and that no carrier's competitive position is damaged relative to others as a consequence of meeting NS/EP requirements. This may prove to be difficult. Also, carriers are likely to include some NS/EP enhancements as common costs in their rate bases in this framework. As a result, the costs for all services will increase, as will the costs of entry for new competitors.

The modified regulatory framework includes the possibility of legislation to provide subsidies and tax incentives to support NS/EP enhancements of carrier-owned facilities. Since such facilities are likely to also support services unrelated to NS/EP needs, questions regarding their proper use may be raised. Establishing equitable arrangements that relate such facilities to a carrier's rate base or expenses may prove to be quite contentious. We have the example of a cost allocation system for AT&T which has been under development at the FCC for the last 20 years.[28] Resolving these questions, if they are raised, may delay the benefits of such initiatives.

Since achieving NS/EP telecommunications objectives becomes a regulatory responsibility in this policy approach, the role of the NS/EP commissioner is essential. As an option, communications law could be

amended to require the President to designate the NS/EP commissioner. Such an amendment might encounter opposition, however, since it could be argued that it would undermine the authority of the FCC Chairman.

In general, the discussion regarding Executive Branch initiatives in the current regulatory framework applies equally to the modified regulatory framework. Policy development for NS/EP telecommunications in the Executive Branch would, of course, capitalize on the policy guidance in the amended Communications Act.

The policy approach in the modified regulatory framework could be initiated by hearings in the Senate and House on amendments to the Communications Act of 1934. These hearings could address specific NS/EP policy guidance to the regulatory process. It would be difficult, however, to limit hearings to NS/EP policy guidance alone, since the impact of such guidance on other regulatory goals would surely become an issue.

3. Presidential Authority Framework

a. Description

In the presidential authority framework, amendments to existing legislation would give the President direct authority over the telecommunications industry. By exercising such authority, the President could require communications carriers to plan and construct their facilities and operate their systems so that they are survivable, restorable, and interoperable.

Presidential authority over the common carriers for NS/EP objectives could be established by either amending the Defense Production Act of 1950 or the Communications Act of 1934.

Defense Production Act Amendment. The Defense Production Act of 1950 could be amended to establish direct presidential authority, conditions on radio licenses, and constraints on land use permits to achieve NS/EP objectives. Such authority would have to be exercised in a

reasonable manner. The direct authority could, by itself, achieve the desired goals. But additional powers beyond the direct regulatory authority could be given to the President to impose conditions on new or renewed permits and licenses for the use of Federal property or other resources. This would allow the President to require all common carriers who use radio systems to meet NS/EP needs.

It could also include any permit to use Federal land. Thus, for example, the President could require a specialized carrier using a mountaintop for a microwave repeater to meet certain standards in the construction and operation of the network. An example of such an amendment follows:

> (1) The President may, by rule or order, require communications carriers to plan their facilities to assure connectivity of communications systems in emergency situations and during recovery from emergency situations, to assure restoration and reconstitution of communications, and to establish a system of priorities for restoration of services and facilities in national emergencies giving precedence to national security and continuity of government telecommunications, if the President makes the finding required by paragraph 3 of this subsection.
>
> (2) The President may by rule or order, if the finding required by paragraphs 3 of this subsection is made, require that any new or renewed permit for the use of Federal lands or any similar permit or license granted to a communications common carrier contain, as a condition of such license or permit, a requirement that the facility or the network extended by such facility established under such permit or license be able to meet such requirements for survivability, interconnection, and restoration as the President may establish.
>
> (3) The authority granted in this subsection may not be used to require modification of a facility or imposition of a condition on a license or permit unless the President finds that (a) such modification or condition is

> necessary to meet the national security, defense, and emergency preparedness needs of the nation; and (b) such requirements cannot reasonably be met without exercising the authority granted in this subsection.

A section of the Defense Production Act of 1950 (50 USC App. Section 2093 "E") could be interpreted or appropriately amended to grant the President the authority to install government-owned equipment on common carrier premises for NS/EP purposes:

> "When in his judgement it will aid the national defense, the President is authorized to install additional equipment, facilities, processes, or improvements to plants, factories, and other industrial facilities owned by the United States Government, and to install Government-owned equipment in plants, factories, and other industrial facilities owned by private persons."*

Communications Act of 1934 Amendment. A range of possible Presidential authorities over the communications carriers could be established by amending the communications law. For example, broad regulatory powers could be transfered to the President by granting him all of the authorities in Title II, Section 214, of the Communications Act of 1934. Section 214 states that a carrier cannot construct new communications facilities, add to existing communications facilities, or reduce or discontinue service unless it first obtains a certificate of public convenience and necessity from the FCC. Such an authority would create a significant Executive Branch responsibility in addition to control over and planning for NS/EP telecommunications matters.

Substantial regulatory authority over communications carriers for NS/EP purposes could also be granted to the President by extending the presidential war powers established in Section 606 of the

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* The applicability of this section depends on the reach intended by the term "industrial facilities".

Act. This is a narrower approach than granting the President Section 214 authority, but it focuses directly on NS/EP needs. An example of such an amendment to Section 606 follows:

> The President may require communications common carriers to plan their facilities to assure connectivity of communications systems in emergency situations, to assure restoration and reconstitution of communications during recovery from emergency situations, and to establish a system of priorities for restoration of services and facilities in national emergencies giving precedence to national security and continuity of government telecommunications if the President finds that such requirements cannot reasonably be met without exercising such authority.

b. Discussion

The principal advantage of this policy approach lies in the ability of the President to assume regulatory powers over the carriers for NS/EP purposes. Direct authority would require the carriers to comply with presidential orders; the delay and uncertainty of regulatory proceedings are simply bypassed for NS/EP needs when determined by the President.

Granting the President direct authority over the carriers is consistent with primary NS/EP telecommunications objectives, such as sustaining all of the President's roles in any emergency including nuclear war.* That is, direct presidential authority over the carriers could lead to efficient policies and measures to assure continuity of government and presidential leadership by minimizing the number of government entities involved in planning and coordinating such policies and measures and by concentrating responsibility in organizations close to the President.

Direct presidential authority could also serve as an organizing principle for NS/EP telecommunications in the Executive Branch. For example, a presidential assistant for NS/EP telecommunications policy

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* The roles of the President during national emergencies are discussed in chapter III.

could advise him on the use of direct authority and coordinate military and civilian emergency preparedness telecommunications needs. Centralized NS/EP telecommunications policy development in the Executive Office of the President is likely to occur in this policy approach. Since NCS would be the principal beneficiary of direct presidential authority over the carriers, it would become more closely tied to the executive office.

In general, the policy approach in the presidential authority framework is most consistent with developing measures to assure presidential leadership in all circumstances.

Government subsidies could pay for the added costs of enhancing NS/EP telecommunications under presidential authority. It is also possible for the President to attach conditions to valuable privileges like operating a satellite system to require carriers to enhance their systems without direct payments.

However, granting the President regulatory powers over the common carriers presents both legal and political difficulties, although amending the Defense Production Act rather than the Communications Act may present less difficulty. Specific authorities, such as requiring carriers using Federal land to meet certain NS/EP standards will be easier to obtain than general regulatory authority over the carriers.

The established common carriers will probably resist a transfer of all regulatory power to the President. The FCC has gained independence and stability growing out of the collegial nature of its decision making and the staggered, seven-year terms of the commissioners.[29] Placing regulatory authority in a single person would concentrate decision making (with a single vote rather than four out of seven required for a majority) and thus increase the uncertainty faced by carriers and the speed at which policy changes occur. Additionally, if not prohibited, Presidents may delegate regulatory authority. Reorganizations in the Executive Branch could introduce instability by shifting the regulatory responsibility among different agencies. The President would become responsible for telephone

rates and facility extensions, which creates political considerations beyond NS/EP telecommunications needs and may complicate satisfying them.

There is also a constitutional question of giving the President regulatory flexibility. Generally, the courts have sanctioned broad and open-ended grants of legislative authority to independent regulatory agencies. But the constitutional separation of powers argues generally against the wholesale transfer of legislative powers to the President.

It is unlikely that a complete transfer of all regulatory powers to the President is required to achieve NS/EP telecommunications objectives. Given the substantial legal and political difficulties of a broad approach, more focused amendments to defense production or communications law, for example, may be more effective.

An amendment to the Defense Production Act for presidential authority over the carriers would probably be referred to the Senate and House Armed Services committees rather than the Commerce committees. Chances of such a referral would be increased if the amendment were part of a larger package of defense-related legislation. However, the Senate and House Commerce committees could also claim jurisdiction. Presumably, such legislation would fare better in the Armed Services committees than in the Commerce committees.

An amendment to the Communications Act of 1934, granting presidential authority over the carriers, would almost certainly be referred to the Senate and House Commerce committees.

It should be less difficult to amend Title VI (miscellaneous provisions) than it is to amend Title II (common carriers) of the Communications Act of 1934, but either course would be difficult. Attempts to amend the common carrier provisions in the 96th Congress led to long contentious debates in both Houses. Extending the war powers granted to the President in Section 606 of Title VI appears to be a most effective way to obtain direct presidential authority over the carriers through communications law.

The FCC is subject to general oversight by the Commerce committees while FEMA and DoD are not. The Commerce committees are closer to the FCC than to FEMA or DoD and regard it as being in their sphere of influence. It is hard to imagine these committees readily transferring authority away from the FCC to an entity outside of their sphere of influence. They will, therefore, be institutionally biased against modifying Section 606 to grant direct authority to the President.

Such an amendment would likely be opposed by many or all specialized carriers and perhaps by AT&T too. Both AT&T and the specialized carriers could be expected to oppose it to some degree, since it would increase their uncertainty and could raise costs without compensating increases in revenues. The specialized carriers could also be expected to oppose such an amendment because of the perceived traditional closeness between AT&T and the Defense Department and a consequent fear that the standards and decisions regarding facility locations made for NS/EP purposes would favor AT&T.

Finally, there is the question of how to affect the vast quantity of communication facilities already in place. The investment by AT&T is said to be about $125 billion. There is, of course, no simple answer to this question; a combination of strategies over time is required. Radio licenses must be renewed every 5 years and the use of other Federal resources are periodically reviewed. Depreciation incentives and government subsidies could help bring about desired changes, as well as contract arrangements for specific improvements.

4. Monopoly Structure Framework

a. Description

The monopoly structure framework would establish a statutory regulated monopoly to provide basic telecommunications services and formally recognize the need for a core network. The rationale for this approach stems from the belief that NS/EP telecommunications objectives

cannot be achieved, or at least would be very difficult to achieve, in a competitive environment. Thus, it is argued, the NS/EP benefits of a single integrated system assured by a monopoly outweigh the postulated gains from increased efficiency or enhanced innovation traditionally attributed to a competitive market.

The Communications Act of 1934 imposed regulation on an existing industry structure that was essentially monopolistic for voice services.* The Act did not presume that a monopoly structure was in the public interest and it would have to be amended, therefore, to achieve a statutory monopoly. In what follows we discuss two initiatives that could be taken to establish and maintain the monopoly structure framework.

Basic Services Monopoly. In this initiative, an amendment to the Communications Act of 1934 bestows regulated monopoly status on the provision of basic telecommunications services. The amendment would seek to sustain the core network for NS/EP objectives. The core network refers to the interoperable physical network of electronic transmission, switching, and terminal facilities that provide universal connectivity between all users, and the associated management, engineering, manufacturing, and operating organizations and personnel required to plan, finance, develop, produce, install, operate, and maintain the network facilities.[30]

The legislation would guide the FCC in achieving NS/EP objectives in a regulated monopoly market. It would allow survivability, interoperability and restorability costs to be included in the carriers' rate bases or expenses, as appropriate. Such costs would be monitored by the FCC and reported to Congress. In regulating the industry the FCC would be instructed to ensure that the benefits of a single-industry system planner and network manager help achieve NS/EP telecommunications objectives. A statutory monopoly would automatically provide antitrust protection for the provision of the services granted monopoly status.

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* See chapter IV

The Consumer Communications Reform Act of 1976 (CCRA), a bill supported by the established telephone carriers, was introduced in both the House and Senate in 1976 and 1977. The bill was initially sponsored by many members of Congress. But it was subsequently abandoned in the House and Senate committees as they became more interested in other approaches to rewriting or amending the Communications Act of 1934. Since CCRA favored a regulated monopoly, its provisions are pertinent to the policy framework under consideration. The main provisions of CCRA were as follows:[31]

> "1. Section 2(c): Congress finds that authorization of lines, facilities or services of specialized carriers which duplicate those of telephone common carriers is contrary to the public interest because they foster inefficiency, wasteful duplication of telecommunications lines and facilities and impair the technical integrity of the integrated nationwide telephone network."
>
> "2. Section 2(d): Congress reaffirms its intent to place regulation of terminal equipment used for telephone service solely with the states even though such equipment may also be used in connection with interstate services."
>
> "3. Section 3: No charges for communication services shall be deemed unjust or unreasonably low so long as the charge is compensatory. (A charge will be considered compensatory so long as it equals or exceeds the incremental cost of providing the service.)"
>
> "4. Section 6: Authorization for specialized common carriers to construct or operate any communication facility or service in interstate commerce shall not be granted unless the specialized common carrier can prove that such facility or service will not duplicate facilities or services provided by the telephone common carriers or cannot eventually be provided by a telephone common carrier."

NS/EP Commissioner. In a regulated monopoly, designating a NS/EP commissioner would be most useful. The NS/EP commissioner would be responsible for the Commission's emergency preparedness, mobilization, and defense activities, as well as continuity of government functions and industry's plans for providing services during a national emergency. The NS/EP commissioner could also assist in the oversight of NS/EP costs included in the carriers' rate bases of expenses.

b. Discussion

This policy's chief advantage for NS/EP telecommunications lies in the benefits derived from a single integrated system. The problems of network management and planning are considerably more tractable when only one organization is responsible for their solution. This approach would also create market conditions that favor including the costs for NS/EP enhancements in the carriers' rate bases or expenses. NS/EP telecommunications costs could be allocated as common costs in the rate bases and expenses of the common carriers in the monopoly structure framework.

Network management is a very complex process requiring the integration of the efforts of diverse and highly skilled craftsmen.[32] Coordination is essential among those responsible for planning, designing, constructing, and operating the telecommunications network. There can only be one system plan for the network, which prescribes not only the transmission, switching, and signaling plans, but also relates them in a meaningful overall framework to achieve the desired network operating characteristics. Technical and engineering principles require compatibility among the facilities in the network. Also, the network must be continuously monitored and maintained to assure proper operation at all times.

A single organization responsible for the network can choose to use its resources and make other decisions necessary to create an effective network management capability. Effective network management is essential to providing services at a sustained quality level by the network

owner. The whole range of complex decisions from deciding when and where to add new transmission and switching technologies to initiating management plans for crises receive the benefit of the attention of a single decision maker. Uniformity, order, and stability are likely to result.

The integrated network management intrinsic in the policy approach of the monopoly structure framework can benefit NS/EP Telecommunications. Network management processes imposed on the provision of monopoly services can also help achieve survivability, restorability, and interoperability of NS/EP telecommunications services. It is simpler to initiate and maintain measures to improve NS/EP telecommunications when there is a single network and a single network manager.

Current planning for emergency network management of our national telecommunications resources when there is widespread damage to the network is inadequate. The policy approach in the monopoly structure framework could advance such planning.

The integrated structure of the established carriers can be very helpful in achieving some of the primary NS/EP telecommunications objectives in this policy aproach. For example, planning and coordinating telecommunications support for essential continuity of government functions at the local, state, and Federal levels can be facilitated by the integrated local, regional, and national organizations of the established carriers.

Planning for NS/EP telecommunications needs can be simpler in this framework. The whole range of capabilities of the established carriers could be more accessible to agencies responsible for NS/EP telecommunications. Procurement will certainly be simplified. In general, the monopoly structure framework appears to be consistent with achieving many of the attributes of the desired NS/EP telecommunications capability.

Legislation establishing this framework could allow carriers to include NS/EP costs in their rate bases or expenses. Alternatively, the FCC could elect to allow such a practice and establish special accounting

procedures. An NS/EP commissioner should be designated to coordinate the management of NS/EP telecommunications expenditures with the Executive Branch and they should be reported to Congress.

Internal subsidies for NS/EP measures are made possible by the monopoly provision of basic telecommunications services. There is an advantage to this approach. Since such measures are apt to be costly, they may become candidates for trimming during the annual budget cycle if they appeared as line items in the budgets of executive agencies.

The policy approach in this framework presumes that a regulated monopoly provides the most assured means of sustaining a unified core network for NS/EP purposes. This premise is primarily based on achieving societal goals like ensuring the continuity of the President's roles in any national emergency rather than achieving economic goals like economies of scale. While related, this premise is fundamentally different than the assertion that basic telecommunications services are a natural monopoly. Therefore, notwithstanding the existence or absence of economies of scale or scope, the policy approach in this framework is more akin to social regulation rather than to economic regulation.

The established carriers once asserted that competition is duplicative and wasteful, disrupts telephone rates, causes residential rates to increase, and harms the network. Still, the FCC in its rather extensive deliberations remained unconvinced that either economic or technical harm would necessarily occur to the network or that some customers would be particularly disadvantaged.[33] The burden of proof has been on those making assertions of harm to the network or to customers.

Current regulatory practice presumes that competition in the telecommunications industry is in the public interest.[34] Although only a small fraction of the total market, competition is well established for intercity services and for equipment at the customer's premises. Using new technologies like satellites and computers, new companies or new services offered by established companies are competing with the established carriers.

The monopoly structure framwork would reverse current trends and place the burden of proof with those advocating competition. The principal disadvantage of this policy approach lies in the great difficulty of reversing current trends. Years of accumulated regulatory practice and numerous court decisions would have to somehow be surmounted. As a result of both regulatory and judicial review, a substantial public record exists on the question of economic and technical harm to the network as a result of expanded competition in the supply of customer-premises equipment and intercity transmission services. For the most part, this record is perceived to support competition since the case for economic or technical harm to the network has not been sustained in these proceedings. Additionally, regulators appear to be currently disposed to arguments favoring increased innovation, lower prices, and a rationalized rate structure claimed for a competitive marketplace. Their decisions have supported competitive entry into the intercity services and the customer-premises equipment markets.

A fundamental shift in telecommunications policy to establish this framework would also be problematic because it is counter to the current general trend of relaxing regulatory constraints over all business activities, as oposed to tightening them.

Another chief difficulty of this policy approach lies in the problem of deciding where to establish the service boundary for regulated monopoly services. This policy approach proposes to provide basic telecommunications services as a regulated monopoly to protect the core network. HR 6121 defined basic telecommunications service as:

> "Section 202. (2) The term basic telecommunications service means that basic two-way switched voice telephone service which is provided as an interexchange telecommunications service or intraexchange telecommunications service on the date of enactment of the Telecommunications Act of 1980 and which is provided on a universal basis to the general public. Such term includes any other interexchange telecommunications service or

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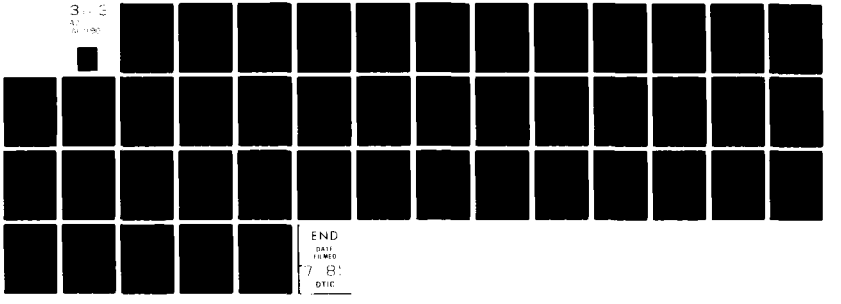

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> intraexchange telecommunications service which the Commission from time to time, determines by rule is recognized as an essential part of an efficient nationwide system of basic telecommunications."

This definition includes universally available interstate and intrastate long distance telephone services as well as intraexchange or local telephone service. But it excludes special common carrier offerings such as Execunet and Sprint. Message Toll Service (MTS) and Wide Area Telephone Service (WATS) are basic services under this definition.

One may propose to establish monopoly status only for the provision of basic MTS/WATS services. The efficacy of this approach is questionable, however, because of the growing substitutability between basic MTS/WATS services and enhanced private line services. The use of Foreign Exchange (FX), Common Control Switching Arrangements (CCSA), and electronic Private Branch Exchanges (PBX) by both the established and the new entrants is blurring the service boundary between message and private line services. In their Report and Third Supplemental Notice of Inquiry and Proposed Rulemaking in the MTS/WATS Market Structure Docket, the FCC said:

> "20. . . . AT&T observes that the traditional distinction between private and message services has become obsolete with the development of electronic PBXs that will automatically route a particular call over point-to-point, FX, WATS, MTS or Execunet-type lines in order to enable a particular user to obtain the least costly combination of interexchange services to meet its needs. The use of such equipment in this manner indicates that most interexchange services, or at least services that can be used for voice communications, are viewed as interchangeable by many customers.
>
> 21. Similar observations are contained in the comments of several other participants. MCI says that the MTS/WATS market is not a meaningful market because other services are highly cross-elastic. Southern Pacific says that MTS/WATS services are not readily distinguishable from other interexchange services. GTE says that the markets are converging. SBS says that neither MTS nor WATS exists as a separate and distinct market."

The FCC concluded that monopoly status for basic MTS/WATS services would not effectively protect them from competition. Significantly, the Commission also decided that competition in all interexchange interstate services is in the public interest and furthers the goals of the Communications Act of 1934.

To establish an effective monopoly, the service boundary will have to be comprehensively conceived to encompass a meaningful market. The wider the boundary is drawn, however, the more difficult it will be to establish monopoly status.

The Consumer Communications Reform Act, which did not become law, proposed a comprehensive service boundary to provide monopoly telecommunication services. Competitive carriers would not be permitted to offer any service that duplicates a service provided by an established carrier or eventually could be provided by an established carrier. The market structure that results from this service boundary would have surely prevented the growth of the specialized common carrier industry as it is known today.

The "carrier's carrier" concept offers another rationale for establishing a monopoly for basic telecommunications services. In this market structure, telephone carriers would provide the basic transmission and switching capacity to resale carriers who would then develop and sell specialized network services on a value-added basis. Resale carriers would not construct their own basic transmission facilities, but may install switching systems. The FCC hoped to encourage the entry of such value-added carriers into the specialized network services market in their decision on resale and sharing in Docket 20097. The FCC also set forth a resale market structure in their final decision in the Second Computer Inquiry by deregulating enhanced services and requiring AT&T to establish a separate subsidiary to provide them. While not establishing a monopoly, these FCC decisions support a resale market structure for basic telecommunications services that allows their economies of scale to prevail where they exist.

In their Second Computer Inquiry decision, the FCC determined that AT&T could provide deregulated enhanced services and customer-premises equipment only through a separate subsidiary, notwithstanding the provisions of the 1956 Consent Decree that prohibits AT&T from engaging in any business activity unrelated to regulated common carrier services. This has prompted AT&T to take two significant initiatives.* First, AT&T has begun to reorganize its corporate structure to accommodate the deregulated markets. Second, AT&T reportedly plans to ask the opinion of the U.S. District Court in New Jersey (with jurisdiction over the Consent Decree) regarding how the FCC has construed the decree to allow AT&T to offer deregulated services through a separate subsidiary.[35]

If AT&T were granted a monopoly to provide basic telecommunications services, they would probably not be allowed to compete in the enhanced services or deregulated customer-premises equipment markets, even through a separate subsidiary. There would most likely be strong opposition to granting AT&T monopoly status in the provision of basic services while simultaneously allowing an AT&T subsidiary to compete in the enhanced services or deregulated customer-premises equipment markets. AT&T could be granted one of these market conditions, but probably not both. The balance between monopoly and exclusion is at the heart of the 1956 Consent Decree.

If AT&T were given a choice of either obtaining a monopoly status for basic telecommunications services or lifting the prohibitions of the Consent Decree, AT&T might choose to provide the expanding new information services of the future. Thus, AT&T could be a principal opponent of establishing a monopoly for basic telecommunications services.

Specialized and other carriers providing transmission and switching services would strongly oppose monopoly status for basic telecommunications services, since it would create uncertainty and

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* At the time of this writing AT&T and the Justice Department are engaged in negotiations to settle the Federal antitrust suit against AT&T. The results could prompt AT&T to take other actions.

constrain their markets, if not destroy them. Many user and consumer groups would also oppose a monopoly.

At present, customer premises equipment may never again be provided on a monopoly basis. Appropriate economies of scale have not been demonstrated to justify sole source production of the diverse array of customer-premises equipment that exists today.

Finally, a monopoly structure framework might be challenged as a vehicle to subsidize measures to enhance the NS/EP capabilities of the common carrier networks. The challenge could stem from the assertion that internal subsidies in the telephone rate structure for such critical social purposes are neither sound public policy nor good economic practice. It could be argued that existing government budgeting and decision mechanisms were specifically designed to make such choices regarding the allocation of public resources and result in the expected visibility, accountability, and efficiency normally required of our democratic processes.

D. Technical Initiatives

Various technical options developed in the course of this study, which are summarized below were given more detailed treatment in a working paper* published separately. Costs associated with the technical options are discussed in Appendix C.

These technical initiatives address various deficiencies and vulnerabilities of the common carrier networks that must be overcome to improve their survivability, interoperability and restorability. Remedial action would also improve their access and routing capabilities for critical users during emergencies.

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* "National Telecommunications Policy Review of U.S. Common Carrier Survivability, Restorability and Interoperability During National Emergencies, Disasters and War. Task 2: Evaluate Technical and System Constraints and Opportunities." December 1980, SRI International, Contract DCA-100-80-C-0019.

Emergency Access. Federal standards for ensuring access to the central office by designated critical emergency users could be developed and prescribed for all common carriers. Where central office equipment can be modified or programmed to give precedence to designated critical subscriber lines, that method is preferred. An alternative method is automated line load control. Load control measures should be initiated within a prescribed time interval if designated critical users are denied access to the system as a result of overloading.

Federal rules for designating critical emergency users could be modified. These rules should be consistent with NCS Memorandum No. 1-68 (Confidential). It defines a critical user as one who meets the requirements for circuit restoration priority 3-A.* Related FCC rules should be amended to permit local emergency officers and telephone company officials to designate nonfederal users who meet those requirements. A list of critical users should be kept at each central office. (See Appendix C, sections B and C).

Precedence-Routing. The FCC rules (64.402) for a precedence system could be amended to be consistent with the restoration priority system. This would include a procedure for granting passwords and authorizing a precedence level. It would also require establishment of a precedence validation and routing system by the common carriers.

A detailed design study and cost analysis could be performed to determine the costs and benefits of using nonhierarchial alternate routing for emergency calls. The primary emphasis of this study should be on Class 4 and 5 offices, but higher level offices should also be considered. (See Appendix C, section D).

Interoffice Signaling. The common channel interoffice signaling (CCIS) system could be modified to include a fail-safe mode. One viable alternative is to include a backup associated signaling capability for a

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* See Ref. 22 for definitions of priority classifications.

fraction of all interoffice trunks. Timeliness of implementation of this recommendation is imperative to minimize its cost. (See Appendix C, section E).

Collateral Damage Avoidance. Both common and special common carriers could be required or encouraged to consider avoiding risk-areas in all new construction other than end offices and subscriber facilities.

A new tariff could be established for routing private lines to avoid risk areas. This should provide for remote monitoring and remote alternate routing (where feasible) to preclude routing to test facilities in a risk area. Federal procurement practices should be modified as necessary to ensure consideration of risk area avoidance for circuits having restoration priorities 1 or 2.

Transmission Interconnect. A study could be conducted to determine the benefits of interconnection between AT&T microwave systems with special common carrier and other private microwave systems to follow different routes between common end points, with the interconnection to be accomplished outside of risk areas at the RF level. This study should determine where suitable propagation paths between relay towers exist and the number of channels that the alternate link could support. (See Appendix C, section F).

Also, Federal transmission standards for emergency interconnect could be established.

EMP Protection. Various common carrier circuits dedicated to crucial warning, conferencing, and command and control functions could be hardened to provide a high degree of protection against damage caused by EMP. (See Appendix C, section G).

Emergency Power. Diesel generators and a reserve fuel supply could be provided to all Class 5 offices that do not now have adequate backup power if commercial power fails during widespread emergencies. (See Appendix C, section H).

Network Management. Special teams could be established in each AT&T region at dispersed locations to manage network traffic and wideband transmission facilities in emergencies. These teams should be specifically trained to maintain and repair of all equipment and facilities in addition to managing network traffic and wideband transmission. This will provide the most effective capability for dispersed emergency restoration and reconstitution of the core network. Retired personnel should be seriously considered as reserves for the special teams.

The Federal Government could contract with AT&T and other carriers to manage the national telecommunication system in a national emergency. Establishing that capability would include procurement, installation, and maintenance of necessary equipment, procedures, and records, plus making necessary prior arrangements with other companies. (See Appendix C, section I).

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X SUGGESTED TOPICS FOR NCS TO CONSIDER

As stated earlier in this report, it is not SRI's intention to recommend a major course of action that NCS or any other agency in the government should take concerning the problem of NS/EP telecommunications. The pros and cons of various alternatives have been presented. But in the process of this study, and from the overall dialogue that has been created, a number of important points have emerged that seem appropriate to pass along. If they were more reasoned they would be recommendations. They are not offered as such--more like suggestions or simply points for consideration. They are intended to address the process rather than the content, at least as far as NS/EP policy is concerned.

The points are not presented in order of importance but are intended to collectively emphasize the need for an improved, general NS/EP telecommunications capability, something SRI believes to be important.

We believe that NCS should:

- Attempt to ensure the orderly management of Executive Branch implementation of NS/EP telecommunications objectives and policy. This may be done within the framework of PD-53.

- Ensure collaboration with the other agencies involved in NS/EP telecommunication to facilitate the development of definitive and validated NS/EP requirements, in both quantitative and qualitative terms.

- Pursue continuous planning for the generation and implementation of telecommunications requirements to ensure consistency with national NS/EP strategies. The communications component of overall strategic policy is vital, and it must be dynamic and adaptable.

- Attempt to explicate Executive Branch positions on NS/EP telecommunications matters pending before the FCC.

- Maintain close cooperation with the various members of the telecommunications industry to enhance consideration of and compliance with Executive Branch NS/EP requirements.

- Pursue an active advisory role to the Executive Office of the President and to OMB on plans, programs and budgeting for NS/EP, in close coordination with EOP advisors on the domestic telecommunications policy.

- Help establish standards for connectivity, and interoperability.

- Coordinate international standards of interoperability and connectivity, particularly within the U.S. alliance structure (e.g., NATO).

- Raise the awareness of the extensive reliance on the common carrier system for NS/EP among members of Congress, the FCC, DoD, the public.

- Undertake measures to educate and inform the new EOP and new executive officials on the requirements of national security telecommunications policy.

- Undertake an examination of the NCS role in global emergency communications systems.

- Conduct network assessments for those networks important to NS/EP.

- Consider the concept of a reserve of telecommunications experts capable of planning, managing and operating a communications network on a contingency basis.

- Maintain expertise and close coverage of legislative efforts on telecommunications; facilitate this by developing a close working relationship with congressional members and staff.

- Develop, in concert with GSA and OMB, concepts and plans for the centralized procurement and operation of telecommunications resources important to NS/EP.

- Develop concepts of joint planning with the common carriers, designed to include all concerned Federal agencies with NS/EP telecommunications responsibilities, the FCC, and the Department of Justice.

The role of communications can not be relegated to a minor role in any national crisis or emergency. Telecommunications within this country has become second nature and to confront a crisis on this soil without it is unthinkable. So the admonition is to think about it, to raise our collective awareness, and plan for an effective capability that will serve us under any circumstance.

APPENDIX A

A DISCUSSION OF E.O. 12046 AND PL 96-511

A. Discussion of Executive Order 12046

The President, under the provisions of Section 4 of Executive Order 12046, March 27, 1978, delegated certain war power and emergency preparedness functions to the Director, Office of Science and Technology Policy (OSTP) and tasked the National Security Council staff with the responsibilty for coordinating the development of policy, plans, programs and standards for the mobilization and use of the nation's telecommunications resources in any emergency. These functions formerly were assigned to the Office of Telecommunications Policy (OTP), which had been abolished by Reorganization Plan No. 1 of 1977. Here we will summarize some of the pertinent parts of E.O. 12046 and its implementation.

The Director (OSTP), in preparing to direct the exercise of the war power functions of the President, and further, in preparing Presidential policy options with respect to the evaluation of the capability of existing and planned telecommunications systems to meet national security and emergency preparedness requirements, including those required to support emergencies defined in the Disaster Relief Act of 1974 (42 USC 5121 et seq., and PL 93-288) will:

- Prepare to assume upon direction, the authorities and responsibilities to be delegated by the Office of Defense Resources (ODR) Actions 9, 10, 13, 14, and 17, Annex B (Actions by the Director of the Office of Defense Resources), Federal Emergency Plan D, with respect to telecommunications facilities and services. Those delegations are:

  -- Priorities and allocations authority with respect to all telecommunications facilities and services subject to the jurisdiction of the United States, as described in the Communications Act of 1934, as amended.

-- Requisition authority for supplies, equipment, and property, or condemnation or use authority over private property in the interest of national security with respect to all telecommunications facilities subject to the jurisdiction of the United States as described in the Communications Act of 1934, as amended.

-- Emergency contracting authority, subject to the provisions of Sections 2 and 3 of ODR Action 13, with respect to the provision of telecommunications services. (This authority may be redelegated to agencies, officers, and employees of the Federal Government).

-- Subject to the provisions of Section 3 of ODR Action 14 and when found that any contractor has failed, or is likely to fail to produce materials or services contracted for under any contract negotiated in accordance with the provision of ODR Action 13, the authority to take immediate possession of the contractor's plant or facility and operate it for the production or furnishing of such materials or services as may be necessary or appropriate to promote the national defense.

-- Authority to restore, repair, expand, or construct essential facilities through loans, loan guarantees, and the obligation or direct expenditure of Government funds; and provide for the operation of facilities acquired by the Government for the purpose of providing telecommunications services.

- Assume responsibility for Annex C-XI (Telecommunications), Federal Emergency Plan D and be responsible for the execution of the authorities and responsibilities set forth in Parts III and IV of the Annex. Part V will be reissued as necessary to reflect the specific organizational arrangements within the Executive Office of the President to carry out the emergency responsibilities associated with Annex C-XI. The responsibilities contained in Parts III and IV are summarized as follows:

  -- Administer the telecommunications resources of the nation during national emergencies with the advice and assistance of the Federal Communications Commission (FCC) and the Executive Agent, NCS.

  -- Administer the war emergency authority over telecommunication assigned to the President by the Communications Act of 1934, as amended.

-- Issue such direction as necessary to the FCC and the Executive Agent, NCS, to assure that the nation's telecommunications facilities and services are available for use, and responsive to a war situation.

-- Issue Telecommunications Orders (TEL ORDERS) as required to implement emergency management of telecommunications resources.

-- Arrange for the relocation to the Federal Preparedness Agency Special Facility for the purpose of performing the functions outlined above.

- In consonance with the policy direction of the National Security Council, provide guidance to the Executive Agent, NCS, as necessary, to assure that the Executive Agent, NCS, is prepared to execute emergency functions that are assigned to NCS in Part III, subparts A, C(4), C(6), and C(10) of Annex C-XI (Telecommunications), Federal Emergency Plan D.

The Manager, NCS, shall, for the Director, OSTP, be the responsible agent for coordination and issuing changes to emergency planning documents and implementing directives.

The former Office of Telecommunications Policy (OTP), issued the following telecommunications circulars, which are to remain in effect and be complied with until superseded, revised or reissued under the authority of OSTP.

- Circular 4 provides guidance for the use of the radio spectrum in a period of war, or a threat of war, or a state of public peril or disaster or other national emergency.

- Circular 7 prescribes procedures for obtaining telecommunication resources during an emergency.

- Circular 10 provides policy guidance whereby certain key government persons may be assured of undelayed residence telephone service during periods of natural disaster or national emergency.

When the appropriate action is taken on these circulars, Title 47 of the Code of Federal Regulations shall be similary revised. Until then, substitute Director, OSTP, for OTP and E.O. 12046 for E.O. 11556.

To fulfill their assigned responsibilities, the National Security Council staff will provide policy guidance to the Executive Agent, National Communications System (NCS).

The Executive Agent, NCS has responsibility for the development and issuance of the telecommunications plans listed below:

a. NCS Telecommunications Management Plan for Annex C-XI (Telecommunications) Federal Emergency Plan D.

b. NCS Plan for Communications Support in Emergencies and Major Diasters.

These national level plans which contain national planning guidance and operational direction for providing telecommunications resource management and telecommunications support in emergency situations will continue as the formal U.S.Government documents applicable to all Federal Departments and Agencies. The Executive Agent, NCS, is hereby tasked as the coordinating authority for the National Security Council staff in these functional areas.

The former Office of Telecommunications Policy (OTP) issued the following telecommunications circulars, which are to remain in effect until superseded by National Security Council directives:

a. Circular 5 designates a focal point within the Federal Government for electromagnetic pulse (EMP) information concerning telecommunications.

b. Circular 6 establishes policies and procedures under which Government and private entities will be furnished restoration priorities to ensure that intercity private line telecommunications services vital to the national interest will be maintained during national emergencies.

c. Circular 8 establishes policies and procedures for a Government and Public Correspondence Telecommunications Precedence System.

d. Circular 9 establishes guidelines and promulgates policy for leasing of telecommunications services for the U.S. Government and negotiation of inter-

governmental agreements for/or involving telecommunications facilities and/or services.

There are additional instructions. Consistent with the NSC responsibility for policy guidance to the NCS, the Executive Agent, NCS, will continue to be responsible for program management and oversight of the Federal Telecommunications Standards Program. A major NCS objective is to be minimization or removal of technical impediments to assure interoperability of government telecommunications systems, particularly for use under national emergency conditions.

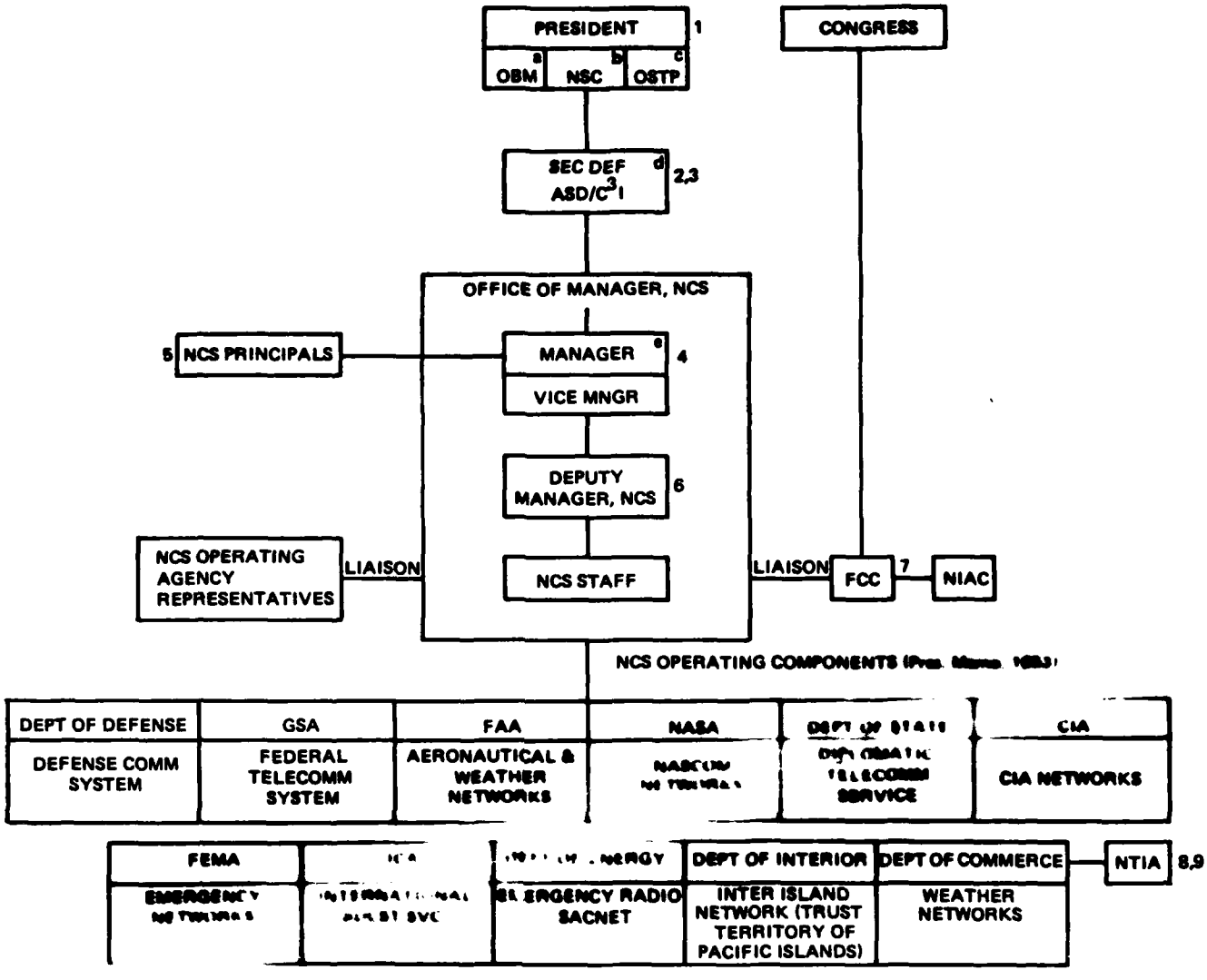
The NCS will also make every effort to insure that standards dealing with the computer communications interface are developed in concert with the National Bureau of Standards and that existing or evolving industry, national, and international standards are used wherever feasible as the basis for Federal telecommunications standards.

Some of the inter-related resposibilities and authorities are summarized in Figure A-1, with emphasis on the NCS. Sources of the authority are indicated on the figure.

B. Discussion of Public Law 96-511

The structure of the Executive Branch organization in telecommunications (including policy) is everchanging. For example, PL 96-511 (Coordination of Federal Information Policy) was recently signed into law by President Carter clarifying the role of OMB. Implementation of this law could be very important to NS/EP telecommunications in the future. Its most important and immediate impact could stem from the oversight authority over R&D granted to the Director of the OMB Office of Information and Regulatory Affairs (OIRA).

> "(5) the general information policy functions of the Director shall include...(6) overseeing planning for and conduct of research with respect to Federal collection, processing, storage, transmission, and use of information."



- a. • Policy for procurement and management of systems
  - Prescribe procedures for reviewing the financing of ncs

  } Pres. Memo. 1963, Ex. Order 12046, 1978
- b. • Policy direction of development and operation of NCS (Pres. Memo 1963)
- c. • Direct the exercise of war power functions (E.O. 12046, 1978)
  - Policy options on evaluation of systems to meet national security and emergency preparedness requirements (E.O. 12046, 1978)
- d. • Plan for and prepare to execute emergency management during national disasters and emergencies
  - Support NSC/OSTP staffs
  - Submit policy issues in assigned areas

  } Pres. Memo 1963, DoD Dir. 5100.41 dated 1979, DoD Dir. 5137.1, 1977
- e. • Perform executive agent's functions as required (DoD Dir. 5100.41, 1979)
  - Assist director, OSTP, in administration of war power functions
  - Prepare national plans
  - Develop standards coordinate operations, conduct exercises
  - Manage RP system, submit reports

1. Policy direction and idrect execution of war power functions (Com: Act 1939, as amended)
2. Executive agent NCS responsibilities assigned to secretary of defense by presidential memorandum 21 August 1962
3. Assistant secretary of defense communications command control and intelligence (and C3I) principal advisor to the executive agent.
4. Director DCA designated to ser ve as manager
5. The key communications officials of the NCS major operating agencies
6. First line management position which is exclusively NCS
7. Planning emergency use of private sector communications
8. Emergency frequency management support to OSTP
9. Policy inputs to the FCC and congress

Figure A-1 ORGANIZATIONAL STRUCTURE OF RESPONSIBILITIES OF THE NCS

Furthermore paragraph 3504 begins as follows:

"(a) The Director shall develop and implement Federal information policies, principles, standards, and guidelines and shall provide direction and oversee the review and approval of information collection requests, the reduction of the paperwork burden, Federal statistical activities, records management activities, privacy of records, interagency sharing of information, and acquisition and use of automatic data processing telecommunications, and other technology for managing information resources. The authority under this section shall be exercised consistent with applicable law."*

In paragraph 3518, a significant caveat was added:

"(a) Except as otherwise provided in this chapter, the authority of an agency under any other law to prescribe policies, rules, regulations, and procedures for Federal information activities is subject to the authority conferred on the Director by this chapter.

"(b) Nothing in this chapter shall be deemed to affect or reduce the authority of the Secretary of Commerce or the Director of the Office of Management and Budget pursuant to Reorganization Plan No. 1 of 1977 (as amended) and Executive Order, relating to telecommunications and information policy, procurement and management of telecommunications and information system, spectrum use, and related matters..."

To further compound the confusion, there is no comma between processing and telecommunications in paragraph 3504 (see underlining added to quote); whereas, in paragraph 3502 separate definitions are offered:

"(2) the terms 'automatic data processing,' 'automatic data processing equipment,' and 'telecommunications' do not include any data processing or telecommunications system or equipment, the function, operation or use of which--

"(A) involves intelligence activities;

"(B) involves cryptologic activities related to national security;

"(C) involves the direct command and control of military forces;

---

* The underlining has been added.

"(D) involves equipment which is an integral part of a weapon or weapons system; or

"(E) is critical to the direct fulfillment of military or intelligence missions, provided that this exclusion shall not include automatic data processing or telecommunications equipment used for routine administrative and business applications such as payroll, finance, logistics, and personnel management..."

APPENDIX B

SOME THOUGHTS ON COSTS AND COSTING METHODOLOGY

A. General

By any measure, the upgrading of existing common carrier facilities to meet NS/EP objectives is a major undertaking. It is natural therefore to ask if the cost of doing so is within reason. Can the entire NS/EP capabilitiy or sensible subelements of it be adequately financed either throught appropriations or tariffs over extended periods of time? How does one establish some balance between the investment cost in nuclear forces and weapon systems and the essential telecommunications and C^3 systems that makes possible their effective employment?

In considering the question of costs it is usually necessary to define a methodology. Since the scope of the study was to include only order-of-magnitude estimates of the cost of creating and maintaining a survivable and enduring system, there was little justification for developing an elaborate cost model and detailed estimates. Therefore, a rather simple framework was devised within which cost estimates could be formulated in conjunction with decisions on the threat being addressed. Some illustrative costs of possible system changes for NS/EP are provided in this appendix.

B. Types of Revenue Sources and Expenditures

There are three basic possibilities for sources of revenue for financing NS/EP improvements in common carrier facilities and services: a common cost tariff based upon shared use of upgraded facilities by the general public, special tariff charges to the NS/EP facilities or services, and specific appropriations. While spot appropriations can finance initial work such as planning, R and D, and even capitalization, the long range financing is and probably will continue to be an aggregation of all three types. The resulting funds then are allocated to various needs according to the perceived threat.

The types of expenditure can be divided into studies and planning, R and D, system acquisition and installation, and operations and maintenance. The first two costs would normally be funded by appropriations whereas the latter two may be provided through appropriations, tariffs or both.

C. A Framework for Cost Planning

In formulating an NS/EP telecommunications capability, it becomes necessary to define a threat. Is it a civil disturbance or a nuclear war for which communications is needed? Thus a spectrum of crisis and conflict should be defined from which priorities could be set and specific requirements would flow. Each of these levels and type of emergency has an associated time scale within which the communications capability is to be developed, implemented, and operated. This is determined by need, system complexity, and available revenues. Figure B-1 illustrates a framework for these dimensions. Planners can first decide the level of conflict or state of preparedness that may be anticipated. The various costs mentioned above can then be allocated along the program life cycle. Integrated costs appear along the right together with the years in the expected life cycle.

To illustrate the use of the chart and at the same time present some costs relevant to the system concept defined in Chapter VIII, a number of cost estimates are presented for implementing that particular NS/EP telecommunications concept.

D. Some NSTS Costs

From the brief description in Chapter VIII it is assumed that an NSTS consists of: all Class 4 and higher switches (about 1800), 1000 end office switches 25 percent of which are community dial offices (CDOs) three fourths of all microwave and cable facilities (7000), increased interconnection for target avoidance at the Class 4 and 5 level (1 new circuit in every 10 switches is 260 circuits), increased interconnection to OCCs and private nets (50 links), connection to AUTOVON and FTS, controlled

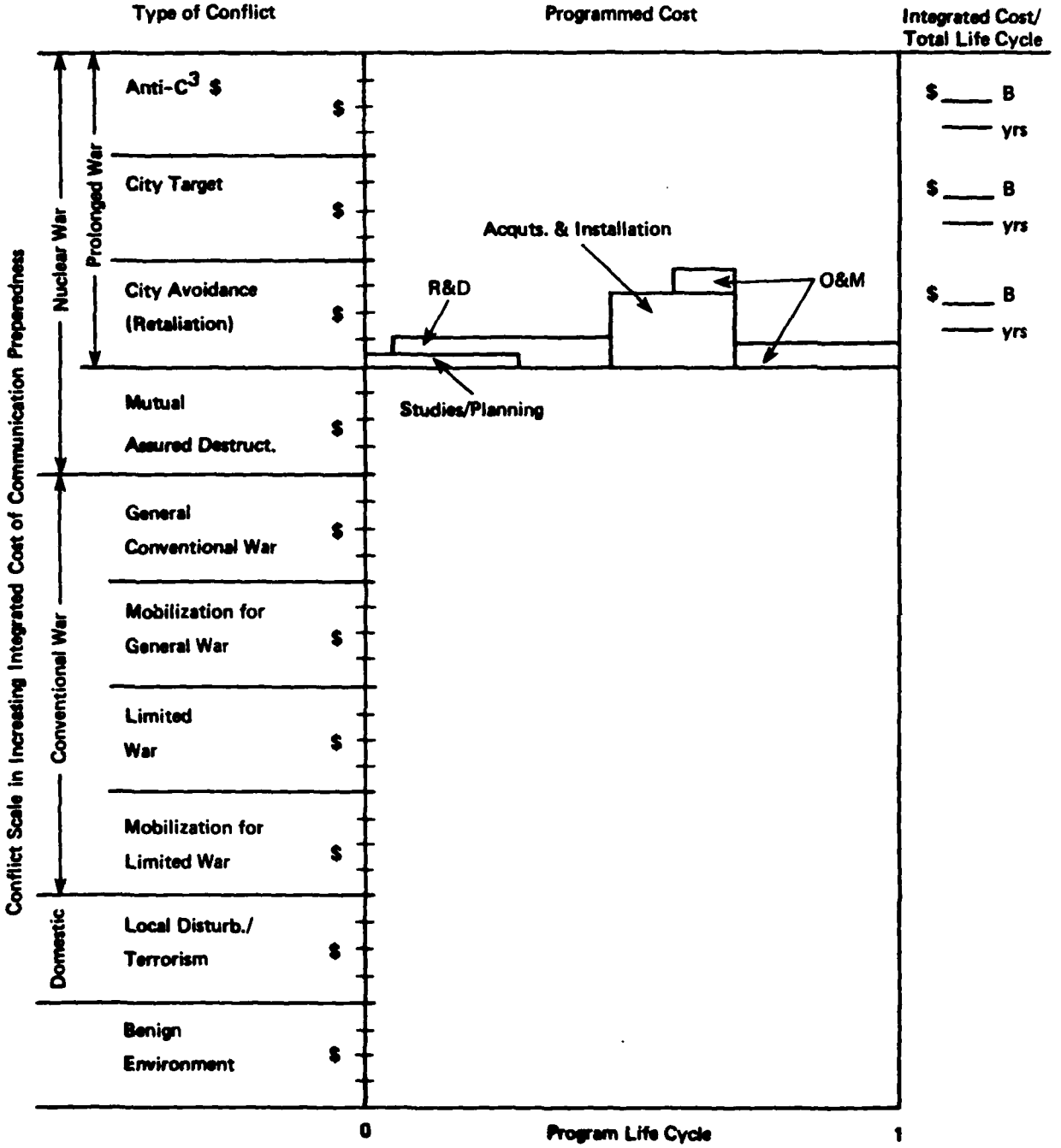


Figure B-1 FRAMEWORK FOR COST PLANNING

access at all Class 4 and 5 switches, precedence verification and routing at all switching facilities, associated signaling as a back-up for CCIS, a USNET type of highly survivable low capability channel, and emergency power backup at all switches.

It is further assumed that of the 1000 local switches 500 are step-by-step, 250 are crossbar, and 250 are ESS. Of the Class 4 and higher 900 are step-by-step, 450 are crossbar, and 450 are ESS.

Rough estimates of the total and annualized costs (one-time costs tariffed at 40 percent annually) are given in Table B-1. More detail on the source of these numbers is given in Appendix C.

TABLE B-1

ESTIMATED COSTS FOR A SAMPLE NSTS

Element	Number of Units	Unit Cost($)	Total ($M)	Annualized ($M)
Controlled Access				
R and D			4.0*	-
Step-by-step	1400	$ 3,000	4.2	1.7
ESS and crossbar	1400	5,500	7.7	3.1
Precedence Verification				
R and D			10.0*	-
CDOs	250	$ 1,200	0.03	-
Step-by-step and crossbar	1850	25,000	46.3	18.5
ESS	700	10,000	7.0	2.8
Precedence Routing				
R and D			4.0*	-
Switches	2550	$ 2,000	5.1	2.0
CCIS Back-up			1.0*	-
EMP Modifications				
Develop and test			4.0*	-
Switches	2800	$ 10,000	28.0	11.2
spares	2800	2,000	5.6	2.2
Microwave/cable heads	7000	2,000	14.0	5.6
spares			1.0	0.4
Interconnections				
Other trunking systems	50	$160,000	8.0	3.2
User network (FTS)	500	10,000	5.0	10.0**
(AUTOVON)	60	60,000	3.6	2.0**
Additional Class 4 and 5 Trunks	260	$320,000	83.2	33.3
Back-up Power	800	$ 10,000	8.0	3.2
USNET	750	$100,000	75.0	30.0
Management and Restoration				
Teams				20.0
NSTS Management/Engineering				3.0
Security				20.8

* One-time cost.
**Includes additional leased-line costs.

APPENDIX C

COSTS ASSESSMENTS

A. Data Base

Recent information on numbers of switch types was found for the Bell System, but none has been found for the independent telephone companies. For costing purposes, we will therefore estimate the number of different types of switches. The Bell System data are shown below. Note that the ratio of switching machines to central offices codes is 10 to 18. Since the independent companies tend to have smaller offices, we will assume that their ratio is about 10 to 13. Since they have about 9,000 central offices codes, using this ratio we estimate that those offices are served by about 7,000 different switching machines. The types of switches are broken down into three types: EES, crossbar, and step-by-step. Community dial offices (CDO) have been estimated to be 90 percent step-by-step, with the remainder about equally divided between ESS and crossbar. Based on these assumptions and extrapolating from the Bell System data, the following estimates are obtained.

	Bell System	Independents	Estimated Total
Central Office Codes	18,399	9,000	27,000
CDO (included)	(3,778)	(3,000)	(7,100)
Switches:			
ESS	2,403	1,500	3,900
Crossbar	3,036	1,800	4,800
Step-by-Step	4,907	3,700	8,600
			17,300

B. Cost for Ensuring Access by Critical Users

Step-by-step offices can be adapted in a fairly straightforward manner, because of their open mechanical and electrical layout. There are three techniques immediately available that can be used to ensure access to

dial tone for privileged lines: noncritical load-shedding, priority access to dial tone (among those initiating a call at the same time), and preemption of noncritical calls in progress to free equipment for critical calls. Load-shedding may be easily accomplished by cutting battery to the line relays of selected lines. There is a buss that carries this battery, and it can be cut so as to deny service to individual lines, groups of 10, or entire hundred groups. This should still allow incoming calls, as talking battery is provided by the connector in this case. Precedence in seizing a line finder is built into step equipment by the nature of the line-finding action. The first level off the post has precedence over higher levels, and the first rotary position has precedence over later positions on that level. In some offices it would be necessary to reassign phone numbers to take advantage of this possibility. Preempting calls in progress is more difficult, but may be accomplished at the line finder with a level-sensing switch (where this is not used for digit absorbing and can be installed). A request for a line finder from a critical line when all line finders are being used would cause the next line finder that was on a noncritical level to open the sleeve lead and drop its call. This line finder would then initiate a new search for lines and precedence would give a dial tone to the critical user.

For a typical step-by-step switch it is estimated that all necessary changes to provide precedence access by critical users can be accomplished for $3000 (7 man days of nontariffed labor, plus 20 changes at $50.)

For the ESS and crossbar switches it is estimated that the [illegible] cost would be about $5,500. The study and development [illegible] equipment, wiring changes, and program changes for [illegible], and dissemination of recommended changes to [illegible] should not exceed $4M.

C. [illegible] ation

[illegible] assumed that a significant study and development effort is required to develop the plans for precedence in the telephone system and equipment, programs and techniques that are appropriate for each type of

switch. It is estimated that the cost of this development effort would be $10M.

It was assumed that all CDO switches will require only sufficient modification to forward the initiating call to the next higher switch for verification. If the call is originated by a critical user, precedence should be assumed for this first step. For an average of 12 critical-user lines per CDO, the cost is estimated to be $1,200 per switch.

For the remaining step-by-step and crossbar switches, verification equipment at an estimated cost of $25,000 per switch can be installed.

For ESS switches, it is expected that all can be programmed to accomplish the verification function, but that added memory will be required by many of them. The original development effort would [illegible] the program to be installed on each switch (by type and [illegible] and would specify the memory space required. The [illegible] programming (and debugging) and of adding memory to [illegible] of the ESS switches is costed at an average of $10,[illegible] switch. (See discussion in Appendix B).

[illegible] of Precedence Routing

Again, a major study, analysis, and development effort would be required to initiate this remedy. Development of programs and wiring changes for different types of switches would be required, done in sufficient detail that modification handbooks can be readily understood and implemented at the local central office. It is assumed that a major computer-analysis effort would be conducted simultaneously of all existing interoffice trunking to determine added routing possibilities using existing transmission assets, and to identify needs for new transmission facilities and their costs and benefits. The cost of these studies and development efforts is estimated to be $4M.

Installation of the wiring and program changes could, on the average, be accomplished for about $2,000 per switch. It is anticipated that future changes in interoffice trunking would entail some annual costs for

consideration of precedence routing, but these should be small (and difficult to separate from the associated moves and changes).

E. Cost of CCIS Backup

As indicated in the discussion [illegible] a small number of trunks with associated signal[illegible] backup when the nonassociated CCIS signaling [illegible] initial cost would be for modifications to the [illegible] the CCIS failure (or sense when associated [illegible] initiated by another switch) and initiate the associated [illegible] mode. It is estimated that the development effort and installation of necessary changes on those switches presently employing CCIS could be accomplished for about $1M. For the next few years, the savings in not having to remove existing signaling equipment as switches are transitioned to CCIS should about offset the small added programming costs. After that time, there would be some annual costs associated with maintenance (an ultimately for replacement) of the associated signaling equipment. Since this equipment will also provide more reliable service for the public telephone system during normal operation, protecting against the unlikely failure of CCIS in a region, and its maintenance would be such a small fraction of the cost of the total facility, suggests that it not be addressed as a separable cost. For this assessment, therefore, no added annual cost for CCIS backup was estimated.

F. Cost of Interconnect

Considering alternate routing between distant AT&T junction offices (and some other AT&T offices that could provide broadband alternate routing capabilities), and considering only routes of SCCs and private microwave systems that are disjoint from AT&T routes, about 50 potential alternate routes were identified.* These links could be employed to enhance the

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* "National Telecommunications Policy Review of U.S. Common Carrier Survivability, Restorability and Interoperability During National Emergencies, Disasters and War. Task 2: Evaluate Technical and System Constraints and Opportunities." December 1980, SRI International, Contract DCA-100-80-C-0019.

restorability of the public telephone system by providing alternate broadband routing capabilities. Junction offices were considered to be of first priority because they have been purposefully sited to avoid risk areas and have the potential for interconnection with a larger fraction of the telephone system than would other types of offices located outside of risk areas.

The minimum installed cost for a new microwave link, using existing towers, with standby equipment at both ends and no added cost for furnishing power is about $40,000. After adding engineering costs, switching equipment, standby power, and EMP protection (for the new link only), the total cost of establishing interconnection between two junction offices via an SCC or private microwave route by using such microwave links at both ends wil be about $160,000. This does not inlcude any remuneration to the owners of the alternate routes for the privilege of interconnecting with them. For the purpose of this cost assessment, it was assumed that permission for such interconnection is legislated or directed by regulation as a condition of their license, such that there is no payment to the owners associated with that interconnection.

For the 50 identified alternate routes, the initial capital investment would be about $10M. If these interconnect facilities were furnished and maintained by the regulated common carriers, the annual tariffed cost would be about 40 percent of the initial capital cost. This cost should also include the costs of a study to determine which of the SCC and private microwave routes can be interconnected via added microwave links and which would be most beneficial for restoration of the broadband transmission network.

G. EMP Protection

Preliminary results from a separate study conducted jointly by a number of different contractors, have identified circuits leased from the common carriers that are crucial to the DoD (warning, conferencing, and command and control functions) and estimated the cost of hardening all necessary facilities to provide a high degree of confidence in the survival

of those circuits from damage by EMP. A preliminary estimate from that study is $225M. Using 40 percent as a conversion factor from capital investment to annual charges, the cost to DoD would be $90M per year.

For the telephone offices and larger facilities to restore at least a fraction of normal services for emergency communications subsequent to component failures resulting from EMP, they may draw upon not only the component spares inventory at that facility but also the surviving components from portions of the system not essential to emergency operation. It is therefore suggested that a significant enhancement of the spares inventory is not required; rather, the small enhancement should be selective, based on vulnerable essential components. The amount of spares that should be added to the inventory depends on estimates of the threat, the components that will fail, and the amount of emergency service needed. Ultimately, however, the cost will be a determining factor. It is estimated that an average of about $2000 per facility will provide a reasonable inventory enchancement.

For microwave-relay and cable-repeater facilities that are remote from the offices, the spare parts should be carried by the maintenance personnel. Some limited amount of substitution of surviving equipment and components will be possible, but greater reliance will be placed on replacement in these facilities. It is estimated that there are about 8,000 common carrier microwave-relay facilities. It is further estimated that EMP damages would occur in about 10 percent of those facilities. A selected compliment of spares for a facility should not cost more than $500; considering imperfect distribution of spares within regions, the total cost for additional microwave spares should not exceed $0.6M. It is estimated that fewer spares would be needed for cable facilities. A maximum cost for additional spares for all transmission facilities should therefore not exceed $1M.

To provide a degree of EMP protection to central offices and microwave relay facilities, the commercial power input to the facilities should be modified as a minimum measure to protect the equipment within the facilities. This can be accomplished at a cost of $10K per office and $1K per microwave site.

H. Emergency Power

A "typical" Class 5 office can be operated under emergency conditions from a 10KW generator. (If traffic load becomes high enough to overload this capacity, then some degree of load-shedding may be required.) The cost of a 10KW diesel generator that is mobile (can be pulled by a truck) is $6,700. It is estimated that up to 80% of the Class 5 offices will require such backup power.

I. Distributed Network Management

As discussed previously, it appears to be certain that network management of not only the telephone system but all other carriers' systems as well is progressing toward highly centralized organization and facilities. During peacetime and in preparation for major disasters this is highly desirable. This section will discuss the costs of maintaining an organization and certain facilities that are largely deployed be in a dispersed condition at all times, and with appropriate warning be fully distributed outside of the risk areas and ready to respond to major damage to the common carrier network and facilities.

It is recommended that two special-force teams of twelve persons each to be set up in each of the ten AT&T regions. Each of these 240 people would be the nucleus around which ad hoc working groups could be formed in the event of a major disaster that disabled the normal network monitoring, control and restoration organization and/or facilities. These groups would be distributed nationwide and, as necessary, would initially assume full responsibility for network management and restoration within their individual spheres of control. As the isolated islands of surviving assets were gradually enlarged and joined in the process of restoration, centralization of control by the special-force teams would gradually occur.

It is suggested that the team members would be assigned regular duties within the system 3/4 of the time. A guiding criteron, however, would be that those duties be at dispersed locations, which would also be their home

stations. The other 1/4 of their time would be devoted to training, both on the job and in formal classes. The added cost for salaries of these teams would therefore be 1/4 of 240, or 60 man-years per year. Assuming a loaded cost for highly skilled personnel of $120K per year, the cost for salaries would be $7.2M per year.

Training and management of these teams are very important considerations. Planning the one-the-job training in each region and monitoring the performance of the teams should be nearly a full-time job for one person, who should also be responsible for scheduling and supervison while personnel are at his/her station, and for ensuring that team facilities are in a continuous state of readiness. Including some clerical support, the personnel costs for the ten regions for these functions would be $1.5M. Direct costs for formal class training have not been included since training would normally occur at centralized locations as a part of regular training; however, the students from the teams would have their salaries paid as a part of the cost of special preparation in the interest of national security.

Per diem and travel costs for time spent away from the home stations will add another $2M to the cost.

Each person on the special-force teams should have an assigned truck with him at most times (taken home in off-duty hours). This would be outfitted with, in addition to normal tools and instruments, special equipment that might be needed in an emergency at a remote location. This should include radiation-protective clothing, monitoring equipment, and complete sets of network plans and channel assignments. On an annualized basis, the cost of such a truck and its operation is estimated to be about $12.5K. For 240, the annual cost would be $3M.

In addition to the individual equipment and transportation, team equipment is also required. Each team should have one large van that could provide switching capability, could set up an emergency relay capability, or could act as a communications control center. Also, each team should have ensured access to and use of a helicopter under emergency

circumstances. For 20 vans and helicopters, the estimated annual cost is $6M.

In summary, the total cost for standby special-force teams for network management and restoration after major loss of network facilities is about $20M per year.

J. Industrial Security

In spite of the intent to widely distribute as much of the upgraded telecommunications resource as possible, there will continue to be very critical nodes in the NSTS and mission-oriented networks. Whether these critical locations are now adequately protected cannot be easily determined, but it is prudent to consider the need for adequate physical protection against sabotage, attacks by terrorists, or similar threats.

Considering the regional and sectional switching centers, the 125 junction points and perhaps 10 or so important international gateway points, there are roughly 200 major nodes. It would cost about 20.8M per year to provide 24-hour guard service at these sites.

APPENDIX D

GLOSSARY

ACS
Advanced Communications Service.

AFOS
Automation of Field Operations and Services (National Weather Service, for distribution of weather services).

ASC
American Satellite Corporation

ASSOCIATED SIGNALING
The transmission of address, supervision, or other switching information along the same circuit established for communications.

AT&T
American Telephone and Telegraph.

AUTODIN
Automatic Digital Network.

AUTOSEVOCOM
Automatic Secure Voice Communication.

AUTOVON
Automatic Voice Network.

BACKBONE
The high-density portion of any communications network (DoD).

BSOC
Bell System Operating Company.

BWC
Board of War Communications.

C^3
Command, control and communications.

C^3I
Command, control, communications and intelligence.

CCIS
Common Channel Interoffice Signaling. A signaling system, developed for use between stored program switching systems, in which all of the signaling information for a group of trunks is transmitted over a dedicated high-speed data link, rather than on a per-trunk basis.

CCRA

Consumer Communications Reform Act.

CCSA

Common-Control Switching Arrangement. An arrangement in which switching for a private network is provided by one or more common-control switching system. The switching system may be shared by several private networks and also may be shared with the public telephone network.

CDNARS

Civil Defense National Radio System.

CDNATS

Civil Defense National Teletypewriter System.

CDNAVS

Civil Defense National Voice System.

CDO

Community Dial Office. A small automatic switching system that serves as a separate exchange area having its own numbering plan and ordinarily having no operating or maintenance force located in its own building.

CENTRAL OFFICE

A switching system that connects lines to lines and lines to trunks.

CIA

Central Intelligence Agency.

CIC

Commander-in-Chief.

CLASS 5 Office

A local central office that serves as the network entry point for station loops and certain special-service lines. Also called "end office." Other offices, classes 1, 2, 3, and 4 are toll offices in the telephone network.

COG

Continuity of Government.

COMSAT

Communications Satellite Corporation. A private corporation (subject to governmental regulation) created by amendment to the Communications Act of 1934 to provide for the establishment, operation, and management of a commercial communications satellite system.

CONUS

Continental United States.

CROSSBAR SWITCH

A relay mechanism consisting of horizontal and vertical paths. Any horizontal path can be connected to any vertical path by means of magnets.

CORE NETWORK

The interoperable physical network of electronic transmission, switching and terminal facilities that provide universal connectivity between all uses, and the associated management, engineering, manufacturing and operating organizations and personnel required to plan, finance, produce, install, operate, and maintain the network facilities.

DCA

Defense Communications Agency.

DCPA

Defense Civil Preparedness Agency.

DCS

Defense Communications System.

DDD

Direct Distance Dialing.

DDS

Digital Data System.

DoD

Department of Defense.

DOMSAT

Domestic Satellite.

DTM

Director of Telecommunications Management.

DTS

Defense Telecommunications System.

ECC

Established Common Carrier.

EMP

Electromagnetic Pulse.

ENDURANCE

A characteristic of a communications system that provides a measure of its ability to endure a prolonged nuclear attack.

EO

Executive Order.

EOP

Executive Office of the President.

ESS

Electronic Switching System. A class of modern switching systems in which the combined control functions are performed principally by electronic devices.

EXECUNET

An intercity telecommunications service provided by MCI that can substitute for MTS among the cities served.

FAA

Federal Aviation Administration.

FEMA

Federal Emergency Management Agency.

FCC

Federal Communications Commission.

FRC

Federal Radio Commission.

FSTS

Federal Secure Telephone System.

FTS

Federal Telecommunications System.

FX

Foreign Exchange Service. A service providing a circuit connecting a subscriber's main station or private branch exchange with a central office of an exchange other than that which normally serves the exchange area in which the subscriber is located.

GAO

Government Accounting Office.

GSA

General Services Administration.

GTE

General Telephone and Electronics.

IBM

International Business Machines.

ICA

International Communicating Agency.

ICC

Interstate Commerce Commission.

IEMATS
Improved Emergency Message Automatic Transmission System.

INTEROPERABILITY
The condition achieved among communications-electronics systems or items of communications-electronics equipment, when information or services can be exchanged directly between them or their users, or both.

IRAC
Interdepartment Radio Advisory Committee.

ITT
International Telephone and Telegraph.

JCS
Joint Chiefs of Staff.

JCSAN
Joint Chiefs of Staff Alerting Network.

JUNCTION OFFICE
A node in a subnetwork surrounding a population center. The subnetwork allows traffic to be rounted around the population center rather than through it, and provides multiple routes for traffic traversing the region.

LSI
Large Scale Integration.

MAD
Mutually Assured Destruction.

MCI
Microwave Communications Inc.

MTS
Message Telecommunications Service, Message Telephone Service, or Message Toll Service.

NADIN
National Airspace Data Interchange Network.

NASA
National Aeronautics and Space Administration.

NAWAS
National Warning System. (Civil Defense Attack Warning System)

NCA
National Command Authority.

NCS
National Communications System.

NETWORK MANAGEMENT
The systematic processes of planning, implementing, operating and maintaining both facilities and services networks.

NOI
Notice of Inquiry.

NSC
National Security Council.

NS/EP
National Security and Emergency Preparedness.

NSTS
National Survivable Telecommunications System.

NTIA
National Telecommunications and Information Administration.

OCC
Other Common Carrier.

OCDM
Office of Civil and Defense Mobilization.

ODM
Office of Defense Mobilization.

ODR
Office of Defense Resources.

OEP
Office of Emergency Preparedness or Office of Emergency Planning.

OMB
Office of Management Budget.

OSTP
Office of Science and Technology Policy.

OTM
Office of Telecommunications Management.

OTP
Office of Telecommunications Planning.

PBX
Private Branch Exchange. A private switching system, either manual or dial, usually serving an organization such as a business, company or a government agency and usually located on the customer's premises.

PD
Presidential Directive.

PM

Presidential Memorandum.

PREEMPTION

The seizure of system facilities which are being used to serve a lower precedence call in order to serve immediately a higher precedence call. (DoD)

PROTECTION CHANNEL

The broadband channel of a carrier system that is utilized as a spare and can be switched into service in the event of a failure of a normal working broadband channel.

PTS

Public Telephone System.

RATE BASE

A firm's investment on which it receives a regulated rate of return.

RAWAC

Rapid Warning and Coordination System (Storm warning and hydrological information, a weather service).

RCA

Radio Corporation of America.

R and D

Research and Development.

RECONSTITUTION

The process associated with system replacement and/or repair ranging from partial reconstitution of switching nodes to reestablishment of transmission links.

RESTORATION

The short-term process whereby high priority circuits are returned to service by providing an alternate existing path (can be accomplished by preempting less critical users).

RESTORATION PRIORITY SYSTEM

Procedures promulgated by the FCC governing the restoration of intercity private line services. It establishes a system of restoration priorities (RPs) that determine the order in which critical circuits are restored.

SBS

Satellite Business Systems. A consortium, composed of IBM, COMSAT General, and Aetna Insurance, offering intercity satellite services with terminals located on the customer premises.

SCC

Special Common Carrier.

SEPARATIONS AND SETTLEMENTS

All telephone companies pool their costs associated with interstate long distance service, inlcuding appropriate portions for local plant. The process of determining the appropriate portion of local plant to be included in the interstate long distance cost is called separations. Long distance or toll revenues also are pooled and distributed to carriers based on their proportionate share of the total costs. This is called settlements.

SPACE ORBITAL SLOT

Parking space for a satellite in a synchronous orbit; the right to use this parking space is part of the radio license for the satellite system.

SPC or SPCC

Southern Pacific Communications Company.

SPRINT

An intercity telecommunications service offered by SPCC that provides customers with a private switched network.

SRF

Strategic Reserve Force.

STEP-BY-STEP

An automatic switching system in which a call is extended progressively step-by-step to the desired terminal under direct control of pulses from a customer's dial or from a sender.

STP

Signal Transfer Point. In CCIS, a message switching system that permits signaling messages to be sent from one switching system to another by way of one or more other offices at which STPs are located. It reduces the number of CCIS data links required to serve the network.

SURVIVABILITY

The capability of a communications system to continue to operate effectively even though portions may suffer physical damage or destruction due to enemy attack or other causes. Methods may include dispersing routing facilities, utilizing different transmission methods, having equipment redundancy, and site hardening.

TARGET AVOIDANCE

The practice of constructing communications facilities outside of areas that are likely targets for nuclear attack.

TCC

Telecommunications Coordinating Committee.

TELCO

Telephone Company.

TELPAK

A private line tariff that provides cost savings for bulk transmission.

TSPS

Traffic Service Position System. That type of Traffice Service System, having stored program control, that provides for the processing and recording of special toll calls, coin station toll calls, and other types of calls requiring operator assistance. It includes traffic service positions arranged in groups called traffic offices where operators are automatically connected in on calls to perform the function necessary to process and record the call correctly.

UHF

Ultra High Frequency.

USITA

United States Independent Telephone Association.

USNET

Ubiquitious Survivable Network. A communications system concept in which multiple networks are linked together to maximize the connectivity of the surviving communications assets.

VHF

Very High Frequency.

VLSI

Very Large Scale Integration.

WATS

Wide Area Telephone Service.

WE

Western Electric.

WU

Western Union.

XTEN

An intercity telecommunications service proposed by XEROX that would utilize radio technology for local distribution.

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